AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:16-cv-00477-B	2/19/2016	Northern District of Texas

PLAINTIFF	DEFENDANT
CommScope Technologies LLC	Dali Wireless Inc

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,326,218	12/4/2012	CommScope Technologies LLC
2	7,639,982	12/29/2009	CommScope Technologies LLC
3	8,577,286	11/5/2013	CommScope Technologies LLC
4	7,848,747	12/7/2010	CommScope Technologies LLC
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☑ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,332,402	5/3/2016	CommScope Technologies LLC,
2	9,031,521	5/12/2015	Dali
3	9,531,473	12/27/2016	Dali
4			
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Karen Mitchell	s/Yolanda Pace	9/13/2017

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:16-cv-00477-B	2/19/2016	Northern District of Texas

PLAINTIFF	DEFENDANT
CommScope Technologies LLC	Dali Wireless Inc

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,326,218	12/4/2012	CommScope Technologies LLC
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4	7,848,747	12/7/2010	CommScope Technologies LLC
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Karen Mitchell	S/Thomas Drew	2/19/2016

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,639,982 B2
APPLICATION NO. : 10/740944
DATED : December 29, 2009
INVENTOR(S) : Philip M. Wala

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page:

The first or sole Notice should read --

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 888 days.

Signed and Sealed this

Ninth Day of November, 2010

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

FOGG & POWERS LLC
5810 W 78TH STREET
SUITE 100
MINNEAPOLIS, MN 55439

Mail Date: 04/27/2010

Applicant	: Philip M. Wala	: DECISION ON REQUEST FOR
Patent Number	: 7639982	: RECALCULATION of PATENT
Issue Date	: 12/29/2009	: TERM ADJUSTMENT IN VIEW
Application No	: 10/740,944	: OF WYETH AND NOTICE OF INTENT TO
Filed	: 12/19/2003	: ISSUE CERTIFICATE OF CORRECTION
		:

The Request for Recalculation is **GRANTED** to the extent indicated.

The patent term adjustment has been determined to be **888** days. The USPTO will *sua sponte* issue a certificate of correction reflecting the amount of PTA days determined by the recalculation.

Prior to the issuance of the certificate of correction, the USPTO will afford patentee an opportunity to be heard and request reconsideration. Accordingly, patentee has **one month or thirty (30) days**, whichever is longer, to file a request for reconsideration of this patent term adjustment calculation. See 35 U.S.C. 154(b)(3)(B)(ii) and 37 CFR 1.322(a)(4). No extensions of time will be granted under 37 CFR 1.136.

Patentee should use document code PET.OP if electronically filing a request for reconsideration of this patent term adjustment calculation. The patentee must also include the information required by 37 CFR 1.705(b)(2) and the fee required by 37 CFR 1.18(e). If patentee does not file a timely request for reconsideration of this patent term adjustment calculation including the information required by 37 CFR 1.705(b)(2) and the fee required by 37 CFR 1.18(e), the USPTO will issue a certificate of correction reflecting the PTA determination noted above.

Patentee should be aware that in order to preserve the right to review in the United States District Court for the District of Columbia of the USPTO patent term adjustment determination, patentee must ensure that he or she also take the steps required under 35 U.S.C. 154(b)(4)(A) in a timely manner. Nothing in the request for recalculation should be construed as providing an alternative time frame for commencing a civil action under 35 U.S.C. 154(b)(4)(A).

Any questions concerning this decision should be directed to the Office of Patent Legal Administration at 571-272-7702.

PTO/SB/131 (02-10)
Approved for use through 02/28/2011. OMB 0651-0020
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REQUEST FOR RECALCULATION OF PATENT TERM ADJUSTMENT IN VIEW OF *WYETH**

Attorney Docket Number: 100.019US02	
Application Number: 10/740,944	Filing Date (or 371(b) or (f) Date): 12/19/2003
Patent Number: 7,639,982	Issue Date: 12/29/2009
First Named Inventor: Philip M. Wala	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT	

PATENTEE HEREBY REQUESTS RECALCULATION OF THE PATENT TERM ADJUSTMENT (PTA) UNDER 35 USC 154(b) INDICATED ON THE ABOVE-IDENTIFIED PATENT. THE PATENTEE'S SOLE BASIS FOR REQUESTING THE RECALCULATION IS THE USPTO'S PRE-*WYETH* INTERPRETATION OF 35 U.S.C. 154(b)(2)(A).

Note: This form is only for requesting a recalculation of PTA for patents issued before March 2, 2010, if the sole basis for requesting the recalculation is the USPTO's pre-*Wyeth* interpretation of 35 U.S.C. 154(b)(2)(A). See Instruction Sheet on page 2 for more information.

Patentees are reminded that to preserve the right to review in the United States District Court for the District of Columbia of the USPTO's patent term adjustment determination, a patentee must ensure that he or she also takes the steps required under 35 U.S.C. 154(b)(3) and (b)(4) and 37 CFR 1.705 in a timely manner.

**Wyeth v. Kappos*, No. 2009-1120 (Fed. Cir., Jan. 7, 2010).

Signature / J. Patrick Kendrick /	Date April 21, 2010
Name (Print/Typed) J. Patrick Kendrick	Registration Number 53109

Note: *Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required in accordance with 37 CFR 1.33 and 11.18. Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below**.*

☐ *Total of _____ forms are submitted.

The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Instruction Sheet for:
REQUEST FOR RECALCULATION OF PATENT TERM ADJUSTMENT IN VIEW OF *WYETH**

(Not to be Submitted to the USPTO)

This form is only for requesting a recalculation of PTA for patents issued before March 2, 2010, if the sole basis for requesting the recalculation is the USPTO's pre-*Wyeth* interpretation of 35 U.S.C. 154(b)(2)(A).

This form must be filed within 180 days of the day the patent was granted, with the following exception:

> Patentees who received a decision from the USPTO under the USPTO's pre-Wyeth interpretation of 35 U.S.C. 154(b)(2)(A) may file a request for reconsideration of that decision if such a request for reconsideration is filed within **two months** of the date of the decision (37 CFR 1.181(f)). If the patentee's sole basis for requesting reconsideration of the decision is the USPTO's pre-Wyeth interpretation of 35 U.S.C. 154(b)(2)(A), the request for reconsideration need only state that reconsideration is being requested in view of Wyeth (this form may be used for this purpose if it is filed within **two months** of the date of the decision from the USPTO).

Do not use this form if the application has been allowed, but not yet issued as a patent.

1. **For patents issued before March 2, 2010:** A request for reconsideration under 37 CFR 1.705(d) and the fee set forth in 37 CFR 1.18(e) are not required, provided that the patentee's sole basis for requesting recalculation of the PTA in the patent is the USPTO's pre-*Wyeth* interpretation of 35 U.S.C. 154(b)(2)(A) and this form is filed within 180 days of the day the patent was granted.

2. **For patents issued on or after March 2, 2010 (do not use this form):** Patentees seeking a revised PTA in a patent issued on or after March 2, 2010, must file a request for reconsideration under 37 CFR 1.705(d) that complies with the requirements of 37 CFR 1.705(b)(1) and (b)(2) within two months of the day the patent issued.

For more information, see "Notice Concerning Calculation of the Patent Term Adjustment With Respect to the Overlapping Delay Provision of 35 U.S.C. 154(b)(2)(A)" available on the USPTO Web site at http://www.uspto.gov/patents/law/notices/2010.jsp.

**Wyeth v. Kappos*, No. 2009-1120 (Fed. Cir., Jan. 7, 2010).

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	7457728
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Joseph Patrick Kendrick./Julia Ehrreich
Filer Authorized By:	Joseph Patrick Kendrick.
Attorney Docket Number:	100.019US02
Receipt Date:	21-APR-2010
Filing Date:	19-DEC-2003
Time Stamp:	16:30:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for PTA recalculation in view of Wyeth	00202775.PDF	138358 e8aed212ca6ac2486462d58df928d451834 55495	no	3

Warnings:	
Information:	

Total Files Size (in bytes):	138358

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/29/2009	7639982	100.019US02	3898

34206 7590 12/09/2009

FOGG & POWERS LLC
5810 W 78TH STREET
SUITE 100
MINNEAPOLIS, MN 55439

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 509 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Philip M. Wala, Waseca, MN;

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

34206 7590 08/13/2009

FOGG & POWERS LLC
5810 W 78TH STREET
SUITE 100
MINNEAPOLIS, MN 55439

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

TITLE OF INVENTION: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	11/13/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, DUC M	2618	455-016000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Fogg & Powers LLC
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: ADC Telecommunications, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Eden Prairie, MN

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee

☒ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.

☒ Payment by credit card. Form PTO-2038 is attached.

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 502432 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Jon M. Powers/ Date 2009-11-12

Typed or printed name Jon M. Powers Registration No. 43868

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Patent Application Fee Transmittal

Application Number:	10740944
Filing Date:	19-Dec-2003
Title of Invention:	POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT
First Named Inventor/Applicant Name:	Philip M. Wala
Filer:	Jon M. Powers/Lisa Gentry
Attorney Docket Number:	100.019US02

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	1501	1	1510	1510
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1810**

Electronic Acknowledgement Receipt

EFS ID:	6441625
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	12-NOV-2009
Filing Date:	19-DEC-2003
Time Stamp:	15:44:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1810
RAM confirmation Number	2198
Deposit Account	502432
Authorized User	POWERS,JON M.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	00185389.PDF	128970 58f6f5c1bffdd76d002d84379fb72c7701ee8d71	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-875)	fee-info.pdf	32047 5e0dbb7a3ac6aa4aa1ed074f5eaaeb5a60eb86ed	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	161017		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/08a (08-08)
Approved for use through 09/30/2008. OMB 0651-0031
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	10740944
Filing Date	2003-12-19
First Named Inventor	Wala
Art Unit	2618
Examiner Name	D Nguyen
Attorney Docket Number	100.019US02

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/D.N./	1	4611323		1986-09-09	Hessenmiiller	
/D.N./	2	4628501		1986-12-09	Loscoe	
/D.N./	3	4654843		1987-03-31	Roza et al.	
/D.N./	4	4691292		1987-09-01	Rothweiler	
/D.N./	5	183 4813054		1980-01-08	Patisaul et al.	
/D.N./	6	4999831		1991-03-12	Grace	
/D.N./	7	5193109		1993-03-09	Chien-Yeh Lee	
/D.N./	8	5243598		1993-09-07	Lee	

AE 9-9-09

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

34206 7590 08/13/2009

FOGG & POWERS LLC
5810 W 78TH STREET
SUITE 100
MINNEAPOLIS, MN 55439

EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

DATE MAILED: 08/13/2009

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

TITLE OF INVENTION: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	11/13/2009

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

34206 7590 08/13/2009

FOGG & POWERS LLC
5810 W 78TH STREET
SUITE 100
MINNEAPOLIS, MN 55439

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

TITLE OF INVENTION: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	11/13/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, DUC M	2618	455-016000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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SUITE 100
MINNEAPOLIS, MN 55439

EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

DATE MAILED: 08/13/2009

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 509 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 509 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	DUC M. NGUYEN	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *5/27/09*.

2. ☒ The allowed claim(s) is/are *1-81*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 7/8/09
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Duc M. Nguyen/ Primary Examiner, Art Unit 2618	7/27/09

REASON FOR ALLOWANCE

1. The following is an examiner's statement of reasons for allowance:

As to claims 1, 14, 25, 28, 33-34, 36-37, 45, 51, 52, 58, 64, 65, 70, 74, 75, 78, 81, the cited prior art of record fail to disclose or make it obvious the claimed invention for the reasons as stated in Applicant's response filed on 5/27/09, pages 24-32.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

2. **Any response to this action should be mailed to:**

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Nay Maung (Supervisor) whose telephone number is (571) 272-7882.

/Duc M. Nguyen/

Primary Examiner, Art Unit 2618

July 27, 2009

Notice of References Cited	Application/Control No. 10/740,944	Applicant(s)/Patent Under Reexamination WALA, PHILIP M.	
	Examiner DUC M. NGUYEN	Art Unit 2618	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,978,650	11-1999	Fischer et al.	725/73
*	B	US-5,809,431	09-1998	Bustamante et al.	455/562.1
*	C	US-5,499,047	03-1996	Terry et al.	725/127
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	Art Unit
	DUC M NGUYEN	2618

SEARCHED

Class	Subclass	Date	Examiner
455	7, 14-22, 553, 561, 3.01, 3.05	8/10/06	DN
370	906, 907, 498, 501, 535-537	8/10/06	DN
Updated	same as aboves	1/25/07	DN
		9/25/07	DN
		10/6/08	DN
		2/18/09	DN
		7/11/09	DN
		7/27/09	DN

SEARCH NOTES

Search Notes	Date	Examiner
see EAST search history	8/10/06	DN
	8/17/06	DN
	1/25/07	DN
	4/24/07	DN
	7/29/07	DN
	1/22/09	DN
	7/27/09	DN

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner
455	16	7/27/09	DN

	/DUC M NGUYEN/ Primary Examiner.Art Unit 2618

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"5724385".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 15:23
L2	19	("5016255" | "5103459" | "5319672" | "5347537").PN. OR ("5724385"). URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/07/27 15:28
L3	21	1 2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 15:33
L4	2	3 and (digital$6 near9 (add$5 summ$6))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 15:33
L15	3265	455/16$7	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 17:31
L16	358	15 and (digital$6 near9 (add$5 summ$6))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 17:31
L17	57	16 and ((digital near5 (antenna remote host)) DRU DHU)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 17:32

L18	2	3 and (digital$6 near3 (add added adder summ$7))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 17:33
L19	2	3 and (digital$6 near9 (add added adder summ$7))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 17:33
L20	77	15 and (digital$6 near3 (add added adder summ$7))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 17:33
L21	17	20 and ((digital near5 (antenna remote host)) DRU DHU)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/07/27 17:34

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	142	455/16.ccls.	USPAT; UPAD	OR	ON	2009/07/27 16:17
L6	6	5 and ((digital near5 remote) DRU)	USPAT; UPAD	OR	ON	2009/07/27 16:18
L7	13	5 and ((digital near5 (antenna remote)) DRU)	USPAT; UPAD	OR	ON	2009/07/27 16:24
L8	7	5 and (digital$6 near9 (add$5 summ$6))	USPAT; UPAD	OR	ON	2009/07/27 16:25
L10	18	7 8	USPAT; UPAD	OR	ON	2009/07/27 16:25
L11	2	7 and 8	USPAT; UPAD	OR	ON	2009/07/27 16:26
L12	9	5 and (digital$6 near2 repeater)	USPAT; UPAD	OR	ON	2009/07/27 17:04

L13	27	("4367485" | "4727590" | "4747160" | "4987486" | "5079628" | "5218714" | "5223923" | "5235619" | "5257099" | "5317392" | "5351270" | "5367571" | "5369779" | "5394559" | "5437052" | "5440632" | "5481073" | "5485221" | "5499047" | "5508733" | "5528582" | "5530469" | "5584046" | "5706048" | "5724666" | "5809431" | "5978650").PN.	US-PGPUB; USPAT	OR	ON	2009/07/27 17:05
L14	3081	455/16$6	USPAT; UPAD	OR	ON	2009/07/27 17:30

7/27/09 6:02:49 PM
C:\Documents and Settings\DNguyen7\My Documents\EAST\Workspaces\200907.wsp

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/740,944	WALA, PHILIP M.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed : November 21, 2006	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
Henry D. Jefferson

U.S. Patent and Trademark Office

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	Art Unit
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008	02/19/2009	07/27/2009					
1	1	✓	✓	✓	=					
2	2	✓	✓	✓	=					
3	3	✓	✓	✓	=					
4	4	✓	✓	✓	=					
5	5	✓	✓	✓	=					
6	6	✓	✓	✓	=					
7	7	✓	✓	✓	=					
9	8	✓	✓	✓	=					
10	9	✓	✓	✓	=					
8	10	✓	✓	✓	=					
11	11	✓	✓	✓	=					
12	12	✓	✓	✓	=					
13	13	✓	✓	✓	=					
14	14	✓	✓	✓	=					
15	15	✓	✓	✓	=					
16	16	✓	✓	✓	=					
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18	18	✓	✓	✓	=					
19	19	✓	✓	✓	=					
20	20	✓	✓	✓	=					
21	21	✓	✓	✓	=					
22	22	✓	✓	✓	=					
23	23	✓	✓	✓	=					
24	24	✓	✓	✓	=					
25	25	✓	✓	✓	=					
26	26	✓	✓	✓	=					
27	27	✓	✓	✓	=					
28	28	✓	✓	✓	=					
29	29	✓	✓	✓	=					
30	30	✓	✓	✓	=					
31	31	✓	✓	✓	=					
32	32	✓	✓	✓	=					
33	33	✓	✓	✓	=					
34	34	✓	✓	✓	=					
35	35	✓	✓	✓	=					
36	36	✓	✓	✓	=					

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=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008	02/19/2009	07/27/2009					
37	37	✓	✓	✓	=					
38	38	✓	✓	✓	=					
39	39	✓	✓	✓	=					
40	40	✓	✓	✓	=					
41	41	✓	✓	✓	=					
42	42	✓	✓	✓	=					
43	43	✓	✓	✓	=					
44	44	✓	✓	✓	=					
45	45	✓	✓	✓	=					
46	46	✓	✓	✓	=					
47	47	✓	✓	✓	=					
48	48	✓	✓	✓	=					
49	49	✓	✓	✓	=					
50	50	✓	✓	✓	=					
51	51	✓	✓	✓	=					
52	52	✓	✓	✓	=					
53	53	✓	✓	✓	=					
54	54	✓	✓	✓	=					
55	55	✓	✓	✓	=					
56	56	✓	✓	✓	=					
57	57	✓	✓	✓	=					
58	58	✓	✓	✓	=					
59	59	✓	✓	✓	=					
60	60	✓	✓	✓	=					
61	61	✓	✓	✓	=					
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64	64	✓	✓	✓	=					
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66	66	=	=	=	=					
67	67	=	=	=	=					
68	68	=	=	=	=					
69	69	=	=	=	=					
70	70	O	=	=	=					
71	71	O	=	=	=					
72	72	O	=	=	=					

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	**Art Unit**
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008	02/19/2009	07/27/2009					
73	73	O	=	=	=					
74	74	=	=	=	=					
75	75	✓	✓	✓	=					
76	76	✓	✓	✓	=					
77	77	✓	✓	✓	=					
78	78	✓	✓	✓	=					
79	79	✓	✓	✓	=					
80	80	✓	✓	✓	=					
81	81	✓	✓	✓	=					

Issue Classification

Application/Control No.	Applicant(s)/Patent Under Reexamination
10740944	WALA, PHILIP M.
Examiner	**Art Unit**
DUC M NGUYEN	2618

ORIGINAL		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
455	16	H 0 4 B 7 / 14 (2006.01.01)	
		H 0 4 B 10 / 00 (2006.01.01)	

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
455	20	7	561	3.05	
370	906	907			
398	173				

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	17	17	33	33	49	49	65	65	81	81				
2	2	18	18	34	34	50	50	66	66						
3	3	19	19	35	35	51	51	67	67						
4	4	20	20	36	36	52	52	68	68						
5	5	21	21	37	37	53	53	69	69						
6	6	22	22	38	38	54	54	70	70						
7	7	23	23	39	39	55	55	71	71						
9	8	24	24	40	40	56	56	72	72						
10	9	25	25	41	41	57	57	73	73						
8	10	26	26	42	42	58	58	74	74						
11	11	27	27	43	43	59	59	75	75						
12	12	28	28	44	44	60	60	76	76						
13	13	29	29	45	45	61	61	77	77						
14	14	30	30	46	46	62	62	78	78						
15	15	31	31	47	47	63	63	79	79						
16	16	32	32	48	48	64	64	80	80						

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	81	
/DUC M NGUYEN/ Primary Examiner.Art Unit 2618	7/27/09	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

PTO/SB/08a (04-09)
Approved for use through 05/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	10740944
Filing Date	2003-12-19
First Named Inventor	Wala
Art Unit	2618
Examiner Name	Duc Nguyen
Attorney Docket Number	100.019US02

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/D.N./	1	5724385		1998-03-03	Levin et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	10740944
	Filing Date	2003-12-19
	First Named Inventor	Wala
	Art Unit	2618
	Examiner Name	Duc Nguyen
	Attorney Docket Number	100.019US02

	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/Duc Nguyen/	Date Considered	07/11/2009

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	10740944
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	Art Unit	2618
	Examiner Name	Duc Nguyen
	Attorney Docket Number	100.019US02

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jon M. Powers/	Date (YYYY-MM-DD)	2009-07-07
Name/Print	Powers, Jon M.	Registration Number	43868

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/08a (04-09)
Approved for use through 05/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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(Not for submission under 37 CFR 1.99)

Application Number	10740944
Filing Date	2003-12-19
First Named Inventor	Wala
Art Unit	2618
Examiner Name	Duc Nguyen
Attorney Docket Number	100.019US02

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5724385		1998-03-03	Levin et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

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	Application Number	10740944
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	Examiner Name	Duc Nguyen
	Attorney Docket Number	100.019US02

	1		☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Art Unit	2618
	Examiner Name	Duc Nguyen
	Attorney Docket Number	100.019US02

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OR

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☐ See attached certification statement.

☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

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Signature	/Jon M. Powers/	Date (YYYY-MM-DD)	2009-07-07
Name/Print	Powers, Jon M.	Registration Number	43868

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	10740944
Filing Date:	19-Dec-2003
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Filer:	Jon M. Powers/Danielle Suess
Attorney Docket Number:	100.019US02

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	5665076
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Danielle Suess
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	08-JUL-2009
Filing Date:	19-DEC-2003
Time Stamp:	17:46:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$180
RAM confirmation Number	3806
Deposit Account	502432
Authorized User	FOGG,DAVID N.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed (SB/08)	00169683.PDF	795555 00871ea3edf318cf4b35d604cd5514c9adb2c52f	no	4
Warnings:					
Information:					
2	Fee Worksheet (PTO-875)	fee-info.pdf	30065 a69ead1b4d4079c7102ab56db0bb28a0e0ab2c08	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	825620		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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Applicant(s)	Wala	**AMENDMENT AND RESPONSE UNDER 37 C.F.R. § 1.111**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Confirmation No.	3898	
Examiner Name	NGUYEN, DUC M	
Group Art Unit	2618	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Office Action mailed on February 27, 2009 has been reviewed. Please amend the above-identified application as follows.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 24 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of claims:

1. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

2. (Original) The system of claim 1, further comprising a wireless interface device coupled to the digital host unit.

3. (Original) The system of claim 2, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

4. (Previously Presented) The system of claim 2, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

5. (Original) The system of claim 1, wherein the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals.

6. (Previously Presented) The system of claim 1, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

7. (Previously Presented) The system of claim 6, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

8. (Original) The system of claim 1, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

9. (Original) The system of claim 1, wherein the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair.

10. (Original) The system of claim 7, wherein the digital host unit further comprises an alarm/control interface circuit coupled to the multiplexer.

11. (Original) The system of claim 1, further comprising a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit.

12. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by a multimode fiber pair.

13. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by single mode fiber.

14. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

15. (Original) The system of claim 14, further comprising a wireless interface device coupled to the digital host unit.

16. (Original) The system of claim 15, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

17. (Previously Presented) The system of claim 15, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

18. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the digital host unit.

19. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the at least one digital expansion unit.

20. (Original) The system of claim 14, wherein the at least one digital expansion units are each coupled to the digital host unit via a multimode fiber pair.

21. (Original) The system of claim 14, wherein the at least one digital expansion unit is coupled to the digital host unit via a single mode fiber.

22. (Previously Presented) The system of claim 14, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

23. (Previously Presented) The system of claim 22, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

24. (Original) The system of claim 14, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

25. (Previously Presented) A method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units;

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units;

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit;

receiving the multiple digital radio frequency signals at the digital host unit;

digitally summing the multiple digital radio frequency signals together; and

converting the summed multiple digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

26. (Original) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises amplifying the analog radio frequency signals.

27. (Previously Presented) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises synchronizing a reverse path local oscillator to a master clock so as to reduce end-to-end frequency translation.

28. (Previously Presented) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units;

receiving the digitized radio frequency spectrum at the plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

29. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum comprises amplifying the radio frequency signals.

30. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum digital radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

31. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises amplifying the analog radio frequency signals.

32. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

33. (Original) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit;

receiving the digitized radio frequency spectrum at the first plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units;

receiving the digital radio frequency signals at the at least one digital expansion unit;

optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units;

receiving the second digitized radio frequency spectrum at the second plurality of digital remote units;

converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

34. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the at least two digital remote units each include:

a main radio frequency antenna;

a duplexer coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path;

a radio frequency to digital converter coupled to the duplexer in the reverse path;

a digital to radio frequency converter coupled to the duplexer in the forward path;

a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path;

an optical transmitter coupled to an output of the multiplexer chip set; and

an optical receiver coupled to an input of the multiplexer chip set;

wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

35. (Original) The system of claim 34, wherein the digital host unit includes an alarm/control interface circuit.

36. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit, wherein the digital host unit includes a channel summer to digitally sum digitized RF signals received at the digital host;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

37. (Currently Amended) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the plurality of second units are located remotely from the first unit;

an analog-to-digital unit to digitize a downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples; ~~and~~

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency signal; and

a digital summer to produce ~~wherein~~ each of the summed upstream digital RF samples ~~is produced~~ by digitally summing respective upstream digital RF samples received from the plurality of second units;

wherein the upstream digital RF samples received from the plurality of second units have an associated resolution;

wherein the digital summer has a resolution that is greater than the resolution associated with the digitized radio frequency signals being digitally summed; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units.

38. (Previously Presented) The first unit of claim 37, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

39. (Previously Presented) The first unit of claim 37, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

40. (Previously Presented) The first unit of claim 37, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

41. (Previously Presented) The first unit of claim 37, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

42. (Previously Presented) The first unit of claim 37, further comprising:

a respective demultiplexer for each of the plurality of second units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of second units.

43. (Previously Presented) The first unit of claim 37, further comprising:

a multiplexer to produce a framed serial bit stream from the second digital samples, wherein the framed serial bit stream is communicated to the plurality of second units.

44. (Previously Presented) The first unit of claim 37, further comprising a clock recovery circuit.

45. (Currently Amended) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium, wherein the plurality of other units are located remotely from the host unit;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit configured to digitize an original downstream analog radio frequency signal produced for radiation from a respective antenna in order to produce downstream digital RF samples; ~~and~~

a digital-to-analog unit configured to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency signal; and

a digital summer to produce ~~wherein~~ each of the summed upstream digital RF samples ~~is produced~~ by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency signal produced for radiation from a respective antenna in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit, wherein the upstream digital RF samples have an associated resolution; and

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency signal; and

wherein the digital summer has a resolution that is greater than the resolution associated with the upstream digital RF samples being summed.

46. (Previously Presented) The system of claim 45, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

47. (Previously Presented) The system of claim 45, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

48. (Previously Presented) The system of claim 45, further comprising:

a respective demultiplexer for each of the plurality of other units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of other units.

49. (Previously Presented) The system of claim 45, further comprising:

a multiplexer to produce a framed serial bit stream from the other digital samples, wherein the framed serial bit stream is communicated to the plurality of other units.

50. (Previously Presented) The system of claim 45, further comprising a clock recovery circuit.

51. (Currently Amended) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing a downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units, wherein the plurality of second units are located remotely from the first unit;

receiving from the plurality of second units respective upstream digital RF samples, wherein the upstream digital RF samples have an associated resolution;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples, wherein the respective upstream digital RF samples received from the plurality of second units are digitally summed with a resolution greater than the resolution of the upstream digital RF samples being summed;

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency signal.

52. (Currently Amended) A first unit comprising:

an interface configured to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit is configured to use ~~uses~~ the interface to communicate to the plurality of second units downstream digital RF samples produced from a downstream analog radio frequency signal produced for radiation from an antenna and wherein the plurality of second units are located remotely from the first unit;

a power distribution interface configured to provide power to at least one of the plurality of second units; and

a digital-to-analog unit configured to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency signal; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units;

wherein the upstream digital RF samples received from the plurality of second units have an associated resolution; and

wherein the upstream digital RF samples are digitally summed with a resolution that is greater than the resolution associated with the upstream digital RF samples being digitally summed.

53. (Previously Presented) The first unit of claim 52, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

54. (Previously Presented) The first unit of claim 52, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

55. (Previously Presented) The first unit of claim 52, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

56. (Previously Presented) The first unit of claim 52, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

57. (Previously Presented) The first unit of claim 52, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

58. (Currently Amended) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium, wherein the plurality of other units are located remotely from the host unit;

wherein the host unit comprises:

an interface configured to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit is configured to use ~~uses~~ the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal produced for radiation from a respective antenna;

a power distribution interface to provide power to at least one of the plurality of other units;

a digital-to-analog unit configured to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency signal; and

~~wherein~~ a digital summer to produce each of the summed upstream digital RF samples ~~is produced~~ by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency signal produced for radiation from a respective antenna in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit, wherein the upstream digital RF samples have an associated resolution;

wherein the digital summer has a resolution that is greater than the resolution of the upstream digital RF samples being summed;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency signal; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

59. (Previously Presented) The system of claim 58, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

60. (Previously Presented) The system of claim 58, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

61. (Previously Presented) The system of claim 58, wherein the interface of the host unit is operable to communicatively couple the host unit to at least one other unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one other unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one other unit.

62. (Previously Presented) The system of claim 58, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

63. (Previously Presented) The system of claim 58, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

64. (Currently Amended) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units, wherein the plurality of second units are located remotely from the first unit;

receiving from the plurality of second units respective upstream digital RF samples, the upstream digital RF samples having an associated resolution;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples, wherein the respective upstream digital RF samples received from the plurality of second units are digitally summed with a resolution greater than the resolution of the upstream digital RF samples being summed;

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency signal; and

distributing power to at least one of the second units.

65. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer; and

wherein the second reference signal is generated by frequency dividing the first reference signal.

66. (Previously Presented) The first unit of claim 65, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;
wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

67. (Previously Presented) The first unit of claim 66, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

68. (Previously Presented) The first unit of claim 65, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

69. (Previously Presented) The first unit of claim 65, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

70. (Previously Presented) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer;

wherein the second reference signal is generated by frequency dividing the first reference signal;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

71. (Previously Presented) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;

wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

72. (Previously Presented) The system of claim 71, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

73. (Previously Presented) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

74. (Previously Presented) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples;

converting the stream of summed upstream digital RF samples to an analog signal;

mixing a signal derived from the analog signal is with a first reference signal to produce a first mixed signal;

mixing a signal derived from a first mixed signal with a second reference signal; and

generating the second reference signal by frequency dividing the first reference signal.

75. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to the plurality of second units using at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the first unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of second units; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units;

wherein sample rates used by the host unit and the other units are locked together.

76. (Previously Presented) The first unit of claim 75, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

77. (Previously Presented) The first unit of claim 75, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

78. (Previously Presented) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the host unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of other units; and

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein sample rates used by the host unit and the other units are locked together.

79. (Previously Presented) The system of claim 78, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

80. (Previously Presented) The system of claim 78, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

81. (Currently Amended) A first unit comprising:

means for communicatively coupling the first unit to a plurality of second units;

means for digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

means for communicating at least a portion of the downstream digital RF samples to the plurality of second units;

means for receiving from the plurality of second units respective upstream digital RF samples, the upstream digital RF samples having an associated resolution;

means for digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples, wherein the means for digitally summing has a resolution that is greater than the resolution of the upstream digital RF samples being summed; and

means for converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency.

REMARKS

The Office Action mailed on February 27, 2009 has been reviewed. Claims 37, 45, 51, 52, 58, 64, and 81 have been amended. Claims 1-81 are pending in this application.

Rejections Under 35 U.S.C. § 103

Claims 37-40, 45-46, 51-55, 58-62 and 64 were rejected under 35 USC § 103(a) as being unpatentable by Chum (U.S. Patent No. 4,667,319).

In rejecting claim 37, the Office Action took the position that the "branching circuit 9" of Chum is a "first unit" as recited in claim 37 and the transmit/receiver (T/R) pairs 10 and 12 are "second units" as recited in claim 37 of the present application. In order to expedite prosecution, claim 37 has been amended to clarify that "wherein the plurality of second units are located remotely from the first unit". Chum clearly indicates that the T/R 10 and 12 are located near the branching circuit 9, not remotely from it.

Also, the Office Action took the position that:

> As to limitation regarding an analog RF signal that is produced for radiation from an antenna, it is noted that the voice signal in Chum is an analog RF signal, and one skilled in art would recognize that the ADCs and DACs configuration in Chum would be applicable to process an RF signal that is produced for radiation from an antenna as well (intended use). Therefore, although Chum fails to teach the voice signal is produced for radiation from an antenna, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations *Ex parte Masham* 2 USPQ2d 1647 1987).

With respect to the assertion in the Office Action that *"one skilled in art would recognize that the ADCs and DACs configuration in Chum would be applicable to process an RF signal that is produced for radiation from an antenna as well (intended*

use)", the Office Action contains no evidence or explanation as to why this is true . Moreover, Chum itself indicates that the ADC/DAC configuration it teaches is not generally applicable (see, Chum, column 3, lines 57-61) but can be used in the particular application described in Chum because of the particular nature of the orderwire, supervisory, and control signals that are communicated (see, Chum, column 3 line 61 - column 4, line 35 -- noting how interference of voice signals with each other is okay, how the supervisory and control signals are frequency multiplexed with the orderwire signals so there should be no interference between the orderwire and the supervisory and control signals, and how there could be interference among supervisory and control signals if two nodes transmit at the same time but the system of Chum is configured so that nodes generally do not transmit at the same time).

With respect to the assertion in the Office Action that *"although Chum fails to teach the voice signal is produced for radiation from an antenna, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations"*, the Office Action contains no explanation as to why the particular claim language noted in the Office Action is "a recitation with respect to the manner in which a claimed apparatus is intended to be employed". The objected to language is a limitation with respect to the analog-to-digital unit. Moreover, in order to expedite prosecution, claim 37 have been amended to clarify that the objected to language is a limitation on the analog-to-digital unit since it must be "configured to digitize a downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples". As noted above, the ADC/DAC configuration of Chum is not configured (that is, does not include the appropriate structure) to handle wireless communications at all and is configured for the particular add-drop multiplexer application shown in Chum (see, e.g., the assumptions in Chum regarding no interference noted above as well as the use of an 8-bit adder).

Furthermore, in order to expedite prosecution, claim 37 has been amended to clarify that "each of the digitized radio frequency signals received at the digital host unit

has a respective associated resolution" and "the digitized radio frequency signals received at the digital host unit are digitally summed with a resolution that is greater than the resolution associated with the digitized radio frequency signals being digitally summed." This feature enables embodiments of the subject matter recited in these claims to handle the full dynamic range of the digitized radio frequency signals being digitally summed. Chum does not teach this feature. Also, as noted above, Chum indicates that the ADC/DAC configuration it teaches is not generally applicable but can be used in the particular application described in Chum because of the particular nature of the orderwire, supervisory, and control signals that are communicated. See, Chum, column 3, lines 57-67 ("In prior art systems supervisory data was branched at the VF (analog) domain because it was believed to be impossible to add two data bits together and to later separate them accurately or without interference between two data bytes sent at the same time. The 3-way branching network shown in FIG. 2 operates without any interference between orderwire signals and the supervisory equipment signals or between supervisory signals sent from various repeater locations. This is because of the way voice and supervisory data are transmitted from a repeater to end offices (terminals)."). For example, Chum is configured so that nodes generally do not transmit supervisory and control data at the same time. See, Chum, column 4, lines 18-35 ("Those stations not addressed do not transmit status information or in effect transmit a binary "0" state. Thus data that is sent from one originating repeater location to an end terminal would not be modified by any intermediate repeater station. This is because the other stations are sending binary "0's", and by binary addition the digital signal added to the line is unchanged by other signals present.").

Independent claims 45, 51, 52, 58, and 64 have been amended in a similar manner as claim 37. Therefore, it is respectfully submitted that at least the same arguments set forth above with respect to claim 37 apply to claims 45, 51, 52, 58, and 64 as well. Moreover, at least the same arguments set forth above with respect to the rejected independent claims apply to the rejected dependent claims 38-40, 46, 53-55, and 59-62 as

well. Applicant, however, does not concede any assertion made in the Office Action with respect to these dependent claims and reserves the right to provide additional arguments directed to the dependent claims if a further response is required.

Claims 1-3, 5-16, 18-32, 34-64 and 75-81 were rejected under 35 USC § 103(a) as being unpatentable by Russell et al. (U.S. Patent No. 5,644,622) in view of Dail (U.S. Patent Number 5,765,097).

With respect to claim 1, the Office Action took the position that Russell teaches "at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1 -47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Figs. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 would be shared by digital remote units 102."

Applicant respectfully traverses the assertion that "it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 would be shared by digital remote units 102." In the system of Russell, a separate transceiver unit 130 is used for each remote antenna unit 102. There is no teaching whatsoever in Russell that a transceiver unit 130 can be used to serve multiple remote units 102. FIG. 13 of Russell clearly shows only a single pair of fibers going to a single remote antenna unit 102. Also, FIG. 13 shows that analog upstream signals from the main cell antenna and analog upstream signals from the transceiver unit 130 are combined in the base station 106' by an analog combiner.

Moreover, the Office Action conceded that "Russell is silent on digitally summing digitized RF signals at the host unit." The Office Action then went on to state:

> However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it would have been obvious that the downstream signal would be splitted in the forward path

> (i.e, downstream direction), and in the reverse path (or upstream direction) from a DRT 102 to the digital host unit 106, upstream signals from these two DRTs 102 (see Fig. 12) would obviously be combined/summed by an optical combiner 946 as shown in Fig. 44, wherein it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the optical combiner 946, the WDM 930 (see Fig. 44) as an integral part of the digital base station 106 (see Figs. 12, 14 regarding WDM 270 as a digital expansion unit of the base station 106) since it has been held that forming in one piece an article which has formally been formed in two pieces and put together involves only routine skill in the art. Howard v. Detroit Stove Works, 150 U.S. 164 (1 893).
>
> However, Russell is silent on the digitally summing of the optical combiner 946. However, in an analogous art, Dail teaches a combiner that clearly digitally adding digital signals (see Fig. 4 regarding refs. 246, 276). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a combiner that is simply digitally summing/adding digitized RF signals from two DRTs in the similar way of an adder as suggested by Dail, as an alternative of design choice.

With respect to the first paragraph from the Office Action noted above, it is noted that the optical combiner 946 shown in Fig. 44 of Russell is located in a remote unit 904, not the base station unit 906. The optical combiner 946 is used to optically combine multiple optical signals (produced by the multiple "analog-to-digital conversion units 944" which are "generally the same design shown with respect to unit 102 shown in FIG. 8", Russell, column 32, lines 25-27) for communication over the transmission media that couples the base station unit to the remote unit. Applicant respectfully submits that it is incorrect to state that it would be obvious "to integrate the optical combiner 946, the WDM 930 (see Fig. 44) as an integral part of the digital base station 106" since the optical combiner 946 is used in the remote unit 904 to facilitate communication from the remote unit to the host unit and would serve no purpose in the base station unit 906.

With respect to the second paragraph from the Office Action noted above, it is noted that the regenerative repeater 220 of Dail—like the optical combiner 946 of Russell—is located at a remote unit that is downstream from the fiber node 18 and downstream from the head end 12.

Claims 2-3 and 5-13 depend from claim 1. Therefore, at least the same arguments set forth above with respect to claim 1 apply to these dependent claims as well. Applicant, however, does not concede any assertion made in the Office Action with respect to these dependent claims and reserves the right to provide additional arguments directed to the dependent claims if a further response is required.

With respect to claim 14, the Office Action rejected claim 14 for the same reasons as claim 1. Therefore, Applicant respectfully submits that at least the same arguments set forth above with respect to claim 1 apply to claim 14 as well.

Claims 15-16 and 18-24 depend from claim 14. Therefore, at least the same arguments set forth above with respect to claim 14 apply to these dependent claims as well. Applicant, however, does not concede any assertion made in the Office Action with respect to these dependent claims and reserves the right to provide additional arguments directed to the dependent claims if a further response is required.

With respect to claim 25, the Office Action rejected claim 25 "for the same reason as set forth in claim 1 above regarding the digital summing." Applicant respectfully submits that at least the arguments set forth above with respect to claim 1 regarding digital summing apply to this rejection of claim 25.

Also, in rejecting claim 25, the examiner took the position that "summing the multiple digital radio frequency signals together (see the summing node in Fig. 13)". Applicant notes that the analog combining shown in Fig. 13 is clearly analog combining, not digitally summing as recited in claim 25 of the present application.

Claims 26-27 depend from claim 25. Therefore, at least the same arguments set forth above with respect to claim 25 apply to these dependent claims as well. Applicant,

however, does not concede any assertion made in the Office Action with respect to these dependent claims and reserves the right to provide additional arguments directed to the dependent claims if a further response is required.

With respect to claim 28, the Office Action rejected claim 28 "for the same reason as set forth in claim 1 above regarding the digital summing." Applicant respectfully submits that at least the arguments set forth above with respect to claim 1 regarding digital summing apply to this rejection of claim 28.

Moreover, claim 28 recites, in part, "receiving radio frequency signals at a digital host unit", "converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum", and "optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units". The Office Action took the position that Russell teaches the shared analog-to-digital converter recited in claim 28 in "either Fig. 4 regarding broadband digitizer 132 or Fig. 21A regarding A/D 132C". However, the signal produced by the broadband digitizer 132 of Fig. 4 only goes to a single remote antenna unit, not to a plurality of digital remotes units and is therefore not a "shared" analog-to-digital converter. Likewise, the A/D 132C of Fig. 21A only goes to a single remote antenna unit, not to a plurality of digital remotes units and is therefore not a "shared" analog-to-digital converter.

Claims 29-32 depend from claim 28. Therefore, at least the same arguments set forth above with respect to claim 28 apply to these dependent claims as well. Applicant, however, does not concede any assertion made in the Office Action with respect to these dependent claims and reserves the right to provide additional arguments directed to the dependent claims if a further response is required.

With respect to claim 34, the Office Action rejected claim 34 "for the same reason as set forth in claim 1 above regarding the digital summing." Applicant respectfully

submits that at least the arguments set forth above with respect to claim 1 regarding digital summing apply to this rejection of claim 34.

Moreover, the Office Action used reasoning with respect to the language in claim 34 regarding "shared circuitry" that is similar to the reasoning used in rejecting claim 1. Therefore, Applicant respectfully submits that at least the arguments set forth above with respect to claim 1 regarding shared circuitry apply to this rejection of claim 34.

Claim 35 depends from claim 34. Therefore, at least the same arguments set forth above with respect to claim 34 apply to the dependent claim as well. Applicant, however, does not concede any assertion made in the Office Action with respect to this dependent claim and reserves the right to provide additional arguments directed to the dependent claim if a further response is required.

With respect to claim 36, it is respectfully submitted that at least the same arguments set forth above with respect to claim 1 apply to claim 36 as well.

With respect to claims 37-64, and 81, these claims were rejected for the same reasons as set forth in claims 1-3, 5-16, 18-32, and 34-36 above. Therefore, Applicant respectfully submits that at least the same arguments set forth above with respect to claim 1-3, 5-16, 18-32, and 34-36 apply to this rejection of claims 37-64, and 81. Moreover, neither Russel nor Dail teaches the amended language recited in these claims.

With respect to claims 75-80, these claims were rejected for the same reasons as set forth in claims 1-3, 5-16, 18-32, 34-36 above. Therefore, Applicant respectfully submits that at least the same arguments set forth above with respect to claim 1-3, 5-16, 18-32, and 34-36 apply to this rejection of claims 75-80.

Claims 4 and 17 were rejected under 35 USC § 103(a) as being unpatentable by Russell et al. (U.S. Patent No. 5,644,622) in view of Dail (U.S. Patent Number 5,765,097) further in view of Kallander et al. (U.S. Patent No. 5,603,080).

Claim 4 depends from claim 1, and claim 17 depends from claim 14. Therefore, at least the same arguments set forth above with respect to claims 1 and 14 apply to this rejection of dependent claims 4 and 17, respectively, as well. Applicant, however, does not concede any assertion made in the Office Action with respect to these dependent claims and reserves the right to provide additional arguments directed to the dependent claim if a further response is required.

Allowable Subject Matter

Applicant thanks the Examiner for the indication that claims 65-74 are allowed.

CONCLUSION

Applicant respectfully submits that claims **1-81** are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 2009-05-27

/Jon M. Powers/
Jon M. Powers
Reg. No. 43868

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Electronic Acknowledgement Receipt

EFS ID:	5406856
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	27-MAY-2009
Filing Date:	19-DEC-2003
Time Stamp:	16:42:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		00165205.PDF	162197 977ed2f4039565f2a57561c63b87c26105fc cc65	yes	33

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	23
	Applicant Arguments/Remarks Made in an Amendment	24	33
Warnings:			
Information:			
	Total Files Size (in bytes):	162197	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/740,944	12/19/2003	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 05/27/2009	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 81	Minus	** 81	= 0	X $ =		OR	X $52=	0
Independent (37 CFR 1.16(h))	* 19	Minus	***19	= 0	X $ =		OR	X $220=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/MARQUITA D. JONES/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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FOGG & POWERS LLC
INTELLECTUAL PROPERTY LAW

April 23, 2009

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In reviewing our Deposit Account statement, we found the following charge made to our account in error. This amount should not have been charged for independent claims in excess of three.

Application No. 10/740,944
Date Charged: 8/8/2008
Amount Charged: $1050.00

Please refund this amount to our deposit account no. 502432. If you have any questions, please contact Danielle Suess at (952) 465-0770 or suess@fogglaw.com.

Thank you for your assistance.

Sincerely,

David N. Fogg
Reg. No. 35138

DNF:dns

5810 West 78th Street, Suite 100 | Minneapolis, MN 55439
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Document code: WFEE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

34206 7590 02/27/2009

FOGG & POWERS LLC
5810 W 78TH STREET
SUITE 100
MINNEAPOLIS, MN 55439

EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

NOTIFICATION DATE	DELIVERY MODE
02/27/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

DAVID@FOGGLAW.COM
DOCKETING@FOGGLAW.COM

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	DUC M. NGUYEN	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2009*.

2a)☐ This action is FINAL. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-81* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *65-74* is/are allowed.

6)☒ Claim(s) *1-64, 75-81* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/14/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to applicant's response filed on 1/16/09. Claims 1-81 are now pending in the present application.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 37-40, 45-46, 51-55, 58-62, 64 are rejected under 35 U.S.C. 103(a) as being unpatentable by Chum.

Regarding claim 37, Chum discloses a first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium (see Fig. 2, wherein the "branching circuit 9" would read on the "first unit", the "T/R 10 and T/R 12" would read on the "second units");

an analog-to-digital unit to digitize an original downstream analog radio frequency signal (39) in order to produce downstream digital RF samples 23, 31 (see Fig. 2, ref. ADC 42 and col. 3, lines 15-56); and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples (21, 33) to a replicated upstream analog radio frequency 41 (see Fig. 2, ref. DAC 44 and col. 3, lines 15-56); and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples (21, 33) received from the plurality of second units (see Fig. 2, ref. 55 and col. 3, lines 15-56); and

wherein the first unit communicates at least a portion of the downstream digital RF samples (23, 31) to the plurality of second units (see Fig. 2 and col. 3, lines 15-56).

As to limitation regarding an analog RF signal that is produced for radiation from an antenna, it is noted that the voice signal in Chum is an analog RF signal, and one skilled in art would recognize that the ADCs and DACs configuration in Chum would be applicable to process an RF signal that is produced for radiation from an antenna as well (intended use). Therefore, although Chum fails to teach the voice signal is produced for radiation from an antenna, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations *Ex parte Masham* 2 USPQ2d 1647 1987).

Therefore, the claimed limitations are made obvious by Chum.

Regarding claim 38, Chum would teach the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable as claimed (see col. 2, lines 26-30).

Regarding claim 39, Chum would teach the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and

a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit as claimed (see Fig. 2, regarding adders 50, 52, 55 and col. 2, lines 26-30).

Regarding claim 40, with the broadest reasonable interpretation, the “branching unit” would read on the claimed “digital host unit” or “digital expansion unit”.

Regarding claims 51, 53-55, the claims are rejected for the same reason as set forth in claims 37-39 above.

Regarding claim 45, the claim is rejected for the same reason as set forth in claim 40 above regarding the “host unit”, wherein it would have been obvious that the system in Chum would be capable of distributing signals to a plurality of subscribers.

Regarding claim 46, with the broadest reasonable interpretation, the “branching unit” would read on the claimed “digital host unit” or “digital expansion unit”.

Regarding claim 52, the claim is rejected for the same reason as set forth in claim 51 above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chum, for providing a power distribution interface as claimed, as an obvious design choice in order to supply power to the T/R units for operation purpose.

Regarding claim 58, the claim is rejected for the same reason as set forth in claims 45, 52 above.

Regarding claim 59, the claim is rejected for the same reason as set forth in claim 58 above. In addition, Chum would teach an ADC as claimed (see Fig. 2, ref. 42).

Regarding claim 60, Chum would teach the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable as claimed (see col. 2, lines 26-30).

Regarding claim 61, Chum would teach the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit as claimed (see Fig. 2, regarding adders 50, 52, 55 and col. 2, lines 26-30).

Regarding claim 62, with the broadest reasonable interpretation, the “branching unit” would read on the claimed “digital host unit” or “digital expansion unit”.

Regarding claim 64, the claim is rejected for the same reason as set forth in claim 52 above regarding the power distribution limitation.

3. Claims 1-3, 5-16, 18-32, 34-64, 75-81 are rejected under 35 U.S.C. 103(a) as being unpatentable by Russell et al (US 5,644,622) in view of Dail (US 5,765,097).

Regarding claim 1, Russell discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Figs. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 would be shared by digital remote units 102.

However, Russell is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it would have been obvious that the downstream signal would be splitted in the forward path (i.e, downstream direction), and in the reverse path (or upstream direction) from a DRT 102 to the digital host unit 106, upstream signals from these two DRTs 102 (see Fig. 12) would obviously be combined/summed by an optical combiner 946 as shown in Fig. 44, wherein it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the optical combiner 946, the WDM 930 (see Fig. 44) as an integral part of the digital base station 106 (see Figs. 12, 14 regarding WDM 270 as a digital expansion unit of the base station 106) since it has been held that forming in one piece an article which has formally been formed in two pieces and put together involves only routine skill in the art. Howard v. Detroit Stove Works, 150 U.S. 164 (1893).

However, Russell is silent on the digitally summing of the optical combiner 946. However, in an analogous art, Dail teaches a combiner that clearly digitally adding digital signals (see Fig. 4 regarding refs. 246, 276). Therefore, it would have been

obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a combiner that is simply digitally summing/adding digitized RF signals from two DRTs in the similar way of an adder as suggested by Dail, as an alternative of design choice.

Regarding claim 2, Russell would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim 3, Russell would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim 5, Russell would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim 6, Russell would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim 7, it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, Russell would obviously

teach the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed.

Regarding claim 8, Russell would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim 9, Russell would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim 10, Russell would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim 11, Russell would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the “digital expansion unit” as claimed (see col. 15, lines 25-36).

Regarding claim 12, Russell would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim 14, the claim is interpreted and rejected for the same reason as set forth in claim 11 above.

Regarding claim 15, the claim is interpreted and rejected for the same reason as set forth in claim 2 above.

Regarding claim 16, the claim is interpreted and rejected for the same reason as set forth in claim 3 above.

Regarding claim 18, Russell would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim 19, Russell would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim 20, the claim is interpreted and rejected for the same reason as set forth in claim 12 above.

Regarding claim 22, Russell would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim 23, it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, Russell would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim 24, Russell would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim 28, the claim is rejected for the same reason as set forth in claim 1 above regarding the digital summing. In addition, Russell discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum (see either Fig. 4 regarding broadband digitizer 132 or Fig. 21A regarding A/D 132C);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see either Fig. 8 regarding D/A 164 or Fig. 21B regarding D/A 144A); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim 30, the claim is rejected for the same reason as set forth in claim 28 above. In addition, Russell discloses converting the radio frequency signal to a

digitized radio frequency sprectrum comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim 34, the claim is rejected for the same reason as set forth in claim 1 above regarding the digital summing. In addition, Russell discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim 35, the claim is interpreted and rejected for the same reason as set forth in claim 10 above regarding the “alarm/control interface”.

Regarding claim 36, the claim is interpreted and rejected for the same reason as set forth in claim 11 above regarding the “digital expansion unit”.

Regarding claim 13, although Russell would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim 21, the claim is interpreted and rejected for the same reason as set forth in claim 13 above.

Regarding claim 25, the claim is rejected for the same reason as set forth in claim 1 above regarding the digital summing. In addition, Russell discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the “wireless interface device”).

Regarding claim 26, the claim is rejected for the same reason as set forth in claim 25 above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for

amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim 27, the claim is rejected for the same reason as set forth in claim 25 above. In addition, Russell discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims 29, 31, the claims are rejected for the same reason as set forth in claim 25 above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell for providing an amplifier during A/D and/or D/A conversions as claimed, for further improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim 32, the claim is rejected for the same reason as set forth in claim 28 above. In addition, Russell discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation

(see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim 33, the claim is interpreted and rejected for the same reason as set forth in claim 28 above. However, Russell fails to disclose a further digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by Dail (see Fig. 2, ref. 220 and col. 4, line 28 – col. 5, line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further incorporate Dail's teaching to Russell, for providing a further digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Regarding claims 37-64, 81, the claims are interpreted and rejected for the same reason as set forth in claims 1-3, 5-16, 18-32, 34-36 above, wherein the DHT or base station would read on the claimed "first unit", the DRT would read on the claimed "second units".

Regarding claims 75-80, the claims are interpreted and rejected for the same reason as set forth in claims 1-3, 5-16, 18-32, 34-36 above, wherein Russell would

obvious teach sample rates used by the host unit and remote units are locked together, in order to achieve synchronization as mentioned by Russell (see col. 12, lines 7-28).

4. Claims 4, 17, are rejected under 35 U.S.C. 103(a) as being unpatentable by Russell in view of Dail and further in view of Kallander et al (US Patent Number 5,603,080).

Regarding claim 4, it is rejected for the same reason as set forth in claim 2 above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, Russell fails to disclose a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that Russell also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed by Kallander (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by Kallander (see col. 4, lines 54-67) to compensate for propagation loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim 17, the claim is interpreted and rejected for the same reason as set forth in claim 4 above.

Allowable Subject Matter

5. Claims 65-74 are allowed.

Response to Arguments

6. Applicant's arguments with respect to claims 1-3, 5-16, 18-27, 34-64, 75-81 have been considered but are moot in view of the new ground(s) of rejection.

As to claim 28, Applicant contends that

> Claim 28 recites in part "converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum" and "optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units."
>
> Russell fails to teach of suggest the use of a "shared analog-to-digital converter" as recited in claim 28. The Office Action makes reference to the embodiment shown in FIG. 12 of Russell. However, neither FIG. 12 nor FIG. 13 of Russell teach the use of a "shared analog-to-digital converter". To the extent that FIG. 13 of Russell teaches anything in this regard, FIG. 13 teaches combining/splitting in the analog RF domain. To the extent that multiple remote antenna units 102 are fed from the same base station, a separate digital/optical transceiver unit 130 is provided for each remote antenna unit 102,with splitting/combining occurring in the analog RF domain.

In response, the examiner asserts that Figs. 12-13 clearly imply that in the downlink direction, the HDT 106 would receive an analog signal from MSTO and convert them to a digital signal for transmitting to DRTs 21. On the uplink direction, the HDT 106 would receive digital signals from DRTs 21 and converting them to an analog signal for transmitting to the MTSO. By doing so, it is clear that the A/D converter and D/A converter implementation of the HDT 106 would be implemented in the Digital/Optical transceiver unit 130 (see Fig. 13), which would clearly shown in details in Figs. 21A and Fig. 21B regarding ref. 132 and ref. 144 for converting RF analog signal to digital signal and vice versa, respectively. Therefore, the A/D converter 132C would

be the shared analog-to-digital converter for a plurality of analog signals received at the HDT 106.

Applicant further contents that

> To the extent that multiple remote antenna units 102 are fed from the same base station, a separate digital/optical transceiver unit 130 is provided for each remote antenna unit 102,with splitting/combining occurring in the analog RF domain.

In response, the examiner asserts that if a separate digital/optical transceiver unit 130 is provided for each remote antenna unit 102, with splitting/combining occurring in the analog RF domain as alleged by Applicant, there would be a splitter in Fig. 13 before the analog signal is inputted to the digital transceiver unit 130. There is no such splitter shown in Fig. 13.

Further, it does not make sense to provide a separate digital/optical transceiver unit 130 for each remote antenna unit 102 because these separate digital/optical transceiver unit 130 would comprise identical components. Therefore, it would have been obvious to one of ordinary skill in the art to utilize a single digital/optical transceiver unit 130 and splitting the signal to several DRT units. Note that this splitting is not limited to only two DRTs, but can be extended to as many DRTs as needed. Therefore, there would be no motivation for providing a separate digital/optical transceiver unit 130 for each remote antenna unit 102. Therefore, the digital signals to/from the DRTs would obviously be splitted/combined by the single digital/optical transceiver unit 130.

As to claim 4, Applicant further contents that

Dail relates to a system in which multiple regenerative repeaters are used. Each regenerative repeater fully demodulates the inbound signal in order to recover the originally transmitted data. The originally transmitted signal is then re-transmitted. Thus, each repeater must have the ability to demodulate and modulate in accordance with the protocol that was originally used to transmit the data. This is how Dail reduces "the amount of aggregated ingressive noise." In other words, the Dail system is modulation dependent. In contrast, the Russell system teaches a modulation independent RF distribution scheme in which a portion of RF spectrum is digitized and then optically transmitted from a first unit to a second unit, where the original RF spectrum is re-created in a digital-to-analog operation. It is respectfully submitted that one of ordinary skill in the art would have picked one or the other scheme but would not have made the combination proposed in the application.

In response, the examiner asserts that the motivation of using a repeater for extending coverage area is well known in the art, this extending coverage area would have nothing to do with modulation schemes and would be irrelevant to the combination. Specifically, Russell as modified does not need to use a digital repeater that is exactly identical to the repeater of Dail.

For foregoing reasons, the examiner believes that the pending claims (1-64, 75-81) are not allowable over the cited prior art.

Conclusion

7. Any response to this action should be mailed to:

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Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Nay Maung (Supervisor) whose telephone number is (571) 272-7882.

/Duc M. Nguyen/

Primary Examiner, Art Unit 2618

Feb 18, 2009

Notice of References Cited	Application/Control No. 10/740,944	Applicant(s)/Patent Under Reexamination WALA, PHILIP M.	
	Examiner DUC M. NGUYEN	Art Unit 2618	Page 1 of 1

U.S. PATENT DOCUMENTS

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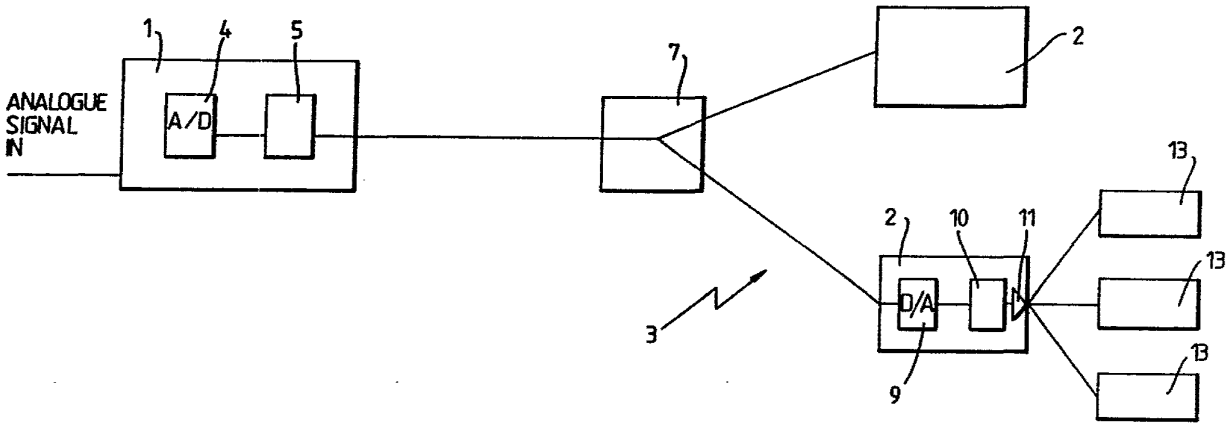
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(54) Title: SIGNAL DISTRIBUTION



(57) Abstract

Signals, such as television signals, are distributed from a head-end station (1) via a fibre network (3). The signals are amplitude modulated on carriers at different frequencies, and the different carriers combined to form a composite analogue signal. In the head-end station (1) the composite analogue signal is clipped to reduce the peak-to-mean ratio and the clipped composite signal is digitised. The resulting digital data is transmitted onto the fibre network and is received at an optical receiver (2). The optical receiver (2) reconstitutes the composite analogue signal for reception by a termination. In one example the composite analogue signal has a bandwidth of one octave or less, and is digitised by sampling at a sampling rate below the Nyquist rate.

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SIGNAL DISTRIBUTION

The present invention relates to the distribution of signals on a network and in particular to the distribution of AM (amplitude modulated) television signals.

Conventionally, television has been broadcast as AM signals with different channels modulated onto sub-carriers at different frequencies. Existing cable television services using copper coaxial cable have adopted corresponding analogue AM techniques to provide channels in a region of the same UHF spectrum used for broadcast television.

It is now proposed to use cable networks such as fibre optic networks for the distribution of television signals. The wide bandwidth offered by such networks offers the possibility of upgrading to carry future wideband services such as HDTV and the same network may also be used for services other than television, such as telephony. However whilst the use of AM techniques is necessary if the television signals are to be received by conventionally equipped television sets there are a number of problems associated with the use economically of AM techniques on optical networks. In particular the carrying of AM optical signals requires less splitting in order to allow a high power budget, and the use of highly specified linear opto-electronic devices.

According to the present invention, a method of distributing signals from a head-end station via an network comprises combining a plurality of AM channels modulated on sub-carriers at different frequencies to form a composite analogue signal, treating the composite analogue signal to reduce the peak-to-mean ratio, digitising the composite analogue signal, transmitting resulting digital data onto the network, receiving the

digital data at a receiver and reconstituting the composite analogue signal for reception at a termination.

Preferably the network is an optical network and the receiver is an optical receiver. Preferably the composite analogue signal is treated by clipping the signal.

A preferred aspect of the present invention provides a method of distributing, e.g., television signals which is particularly well-adapted to use with optical networks whilst at the same time maintaining compatibility with conventional analogue television sets. As noted above, television signals used for terrestrial broadcasting are modulated onto sub-carriers at different frequencies. When a composite signal is formed by adding together the different channels the resulting waveform has a much higher peak-to-mean ratio than the individual carriers. It is therefore possible to clip or compress the maxima and minima before quantising without significantly degrading the performance. The A/D converter used for digitising the signal can then operate over a more restricted input amplitude range and so requires fewer quantisation levels to achieve an adequate output video signal-to-noise ratio.

Preferably the method includes receiving the digitised signal at a node remote from the termination and transmitting the reconstituted signal onwards for reception at the termination.

The detection of the digital data is advantageously carried out at a node such as a distribution box or pedestal near the customer's premises. The television signals may then be delivered over conventional coaxial cable in a standard format, avoiding the need for a special adapter or other equipment at the customer-end.

Preferably the composite analogue signal has a bandwidth of one octave or less and is digitised by sampling at a sampling rate below the Nyquist rate.

Preferably, in addition to or as an alternative to clipping the composite analogue signal the method further comprises compressing the composite analogue signal at the head-end station and applying complementary expansion at the receiver.

Companding may be carried out either in the analogue or in the digital domain and preferably the compression function is the cumulative distribution function of the Gaussian probability distribution function.

According to a further aspect of the present invention there is provided a system for distributing signals comprising a head-end station, one or more receivers, and a network connecting the head-end station to the or each receiver, the head-end station including an input stage arranged to receive a composite analogue signal comprising a plurality of AM channels modulated on sub-carriers at different frequencies, converter means arranged to treat the composite analogue signal to reduce the peak-to-mean ratio and to digitise the composite analogue signal, and transmitter means arranged to transmit the resulting digital data onto the network, the receiver including reconstituting means arranged to reconstitute the composite analogue signal and output means arranged to output the composite analogue signal for reception by a termination.

A method and system in accordance with the present invention will now be described in further detail with reference to the accompanying drawings, in which:

Figure 1 is a block diagram showing a distribution system;

Figure 2 is a block diagram showing a signal path in greater detail;

Figure 3 is a diagram showing an alternative arrangement for the multiplexer of Figure 2; and

Figures 4a - 4d are diagrams showing sub-carriers and a composite signal.

A system for distributing television signals via an optical fibre network comprises a head-end station 1 and a number of optical receivers 2 connected to the head-end station 1 via a fibre network 3. In the present example the fibre network 3 is a passive optical network using a star topology but the present invention is equally applicable to other fibre optic networks using different topologies.

The head-end station 1 receives at its input a composite analogue signal which in the present example covers the spectrum from 470-860 MHz. This input signal comprises sub-carriers at different frequencies amplitude-modulated with different television signals. These signals are input to an A/D converter 4 which, as described in further detail below, clips and digitises the signal. An optical transmitter 5 modulates an optical signal with the digital data output by the A/D converter and outputs the signal onto the fibre network 3. The signal passes through different stages of the fibre network 3, including one or more passive optical splitters 7 and is received by the optical receivers 2. For clarity only two optical receivers 2 are shown in Figure 1, but in practice many more may be connected to each network. At the receivers 2 which may, for example, be positioned in street cabinets, the composite optical signal is reconstituted from the optical data and output as an analogue signal via coaxial cables 8 to conventional television sets 13.

The signal path from the head-end station 1 to the television set is shown in greater detail in Figure 2. Data is output from the A/D converter 4 in parallel as

8-bit words. An 8:1 multiplexer 8 converts the output from the A/D converter 4 to a serial bit stream. This bit stream is used to modulate the output from the optical transmitter 5 using conventional techniques. The operation of the multiplexer 8 is locked to a 7 GHz clock generated locally in the head-end station. This clock signal is divided by eight to provide a lower rate clock for the A/D converter 4. In transmission over the fibre network 3 the signal output by the transmitter 5 may be split up to 49 ways, within the constraints of the power budget in the present example. At the receiver 2 a 1:8 demultiplexer 12 assembles 8-bit parallel words from the serial datastream and outputs those 8-bit words to a D/A converter 9. The output from the D/A converter 9 passes through a band pass filter 10 and via an output amplifier stage 11 to up to 20 different television sets 13 connected to the receiver 2 by conventional coaxial cables.

The system may be used to distribute signals to so-called "cable ready" sets. Such sets typically have a VHF baseband input up to 450 MHz. For such systems use can be made of aliasing channels present in the lower frequency range. These are channels at frequencies below those of the original components of the composite analogue signal which are generated as a result of sampling below the Nyquist rate. In this case the reconstituting filter 10 is a low-pass filter rather than a band-pass filter. The low frequency channels output from the reconstituting filter are inverted unless the input to the A/D converter is first inverted.

Figures 4a - 4d, show schematically the formation of the composite analogue signal from three carriers c_1, c_2, c_3. The carriers have amplitudes p_1, p_2, p_3 respectively. The mean (rms) level of each carrier is then $p_n/(2\ 2)$. The different component carriers add

together to form the composite signal shown in Figure 4d. It can be shown that the amplitude of the composite signal, when it comprises n channels, each of amplitude p is np and its mean level is n(p/2 2). The peak-to-mean ratio of the composite signal is therefore far greater than that of the individual sub-carriers. At the input to the A/D converter relatively severe clipping may be applied to limit the dynamic range of the signal prior to quantisation making it possible to minimise the number of quantisation levels without significant loss in the quality of the signal. Clipping may be applied using an appropriate clipping stage before the A/D converter. Alternatively if that converter has suitable clipping characteristics clipping may be achieved by overloading it by a suitable margin.

The composite analogue signal is limited in bandwidth to less than one octave. Not only does this serve to reduce second order intermodulation distortion but it makes possible sampling at a rate below the Nyquist minimum, that is twice the frequency of the maximum frequency component of the signal. Sampling below the Nyquist rate causes aliasing distortion. When however the signal is confined to less than one octave and sampled at a rate only slightly greater than the maximum frequency component the aliasing distortion falls in the unused frequency band below the signal octave band. The aliasing distortion therefore does not compromise the performance of the system and the bit rate of the system is only one half that needed for full Nyquist sampling. As noted above, when generating signals for cable-ready VHF TV sets the production of low frequency aliasing channels may be used to shift the received channels into the desired frequency range.

The A/D converter 4 defines a number of amplitude bands and determines which amplitude band matches the

sample value. Each amplitude band is represented by a binary word and a byte is output accordingly. The resultant bit rate when these bytes are converted to a serial stream by the 8:1 multiplexer 8, is the product of the sampling rate and the number of digits in a byte. Clipping minimises the number of quantisation levels required and so enables a reduction in the byte size and bit rate.

Optionally compression may be applied to the signal before or after it is sampled by the A/D converter 4. Known A/D converters for video signals use linear quantising with one output byte representing one quantisation level. The present system however by applying compression to the composite analogue signal as it is digitised reduces the number of possible output words required for a given output video quality by a factor of two or more, giving a further saving in the bit rate. The preferred compression function is the cumulative distribution function of the Gaussian probability distribution function (PDF). If the input waveform to the compressor has a Gaussian PDF, the output PDF from the compressor is uniform with output in the range 0 to 1. This uniform PDF can then be quantised linearly and each output codeword is then equi-probable. The compressor and matching expander at the receiver may be realised in hardware using a network of diodes and resistors, or in software using a look-up table following a suitable linear A/D converter.

The digital circuits in the head-end station 1 and the receiver 2 are synchronised using word alignment techniques. For example, the least significant bit in each word may be identified by a periodic function such as a Barker code by regular bit stealing. This sequence is then detected using a suitable sampler, logic function

and clock slip circuit. Preferably the clock operates at the word rate rather than the serialised bit rate.

In an alternative arrangement shown in Figure 3 two 8:1 multiplexers are used in parallel at a lower clock rate of 1.2 GHz. In this case a pair of A/D converters are used, operating at a clock rate one eighth of that of the multiplexers.

Although the embodiment discussed above relates to the distribution of television signals, the invention, in its broadest aspects, is applicable to other signals such as, e.g., audio signals.

CLAIMS

1. A method of distributing signals from a head-end station via a network comprising combining a plurality of AM channels modulated on sub-carriers at different frequencies to form a composite analogue signal, treating the composite analogue signal to reduce the peak-to-mean ratio, digitising the composite analogue signal, transmitting resulting digital data onto the network, receiving the digital data at a receiver and reconstituting the composite analogue signal for reception at a termination.

2. A method according to claim 1, in which the network is an optical network, the receiver is an optical receiver, and the composite analogue signal is treated by clipping the signal.

3. A method according to claim 1 or 2, including receiving the digitised signal at a node remote from the termination, and transmitting the reconstituted signal onwards for reception at the termination.

4. A method according to claim 2 or 3, in which the composite analogue signal has a bandwidth of one octave or less and is digitised by sampling at a sampling rate below the Nyquist rate.

5. A method according to any one of claims 1 to 4, including compressing the composite analogue signal at the head-end station and applying complementary expansion to the signal at the receiver.

6. A system for distributing signals comprising a head-end station, one or more receivers, and a network connecting the head-end station to the or each receiver, the head-end station including an input stage arranged to receive a composite analogue signal comprising a plurality of AM channels modulated on sub-carriers at different frequencies, converter means arranged to treat

the composite analogue signal to reduce the peak-to-mean ratio and to digitise the composite analogue signal, and transmitter means arranged to transmit the resulting digital data onto the network, the receiver including reconstituting means arranged to reconstitute the composite analogue signal and output means arranged to output the composite analogue signal for reception by a termination.

7. A system according to claim 6, in which the network is an optical network, the receiver is an optical receiver, and the converter means are arranged to clip the composite analogue signal.

8. A system according to claim 7, in which the or each optical receiver is located at a respective node remote from the termination and is arranged to transmit the reconstituted signal onwards for reception at the termination.

9. A system according to claim 7 or 8, in which the composite analogue signal has a bandwidth of one octave or less and the converter means are arranged to sample the composite analogue signal at a sampling rate below the Nyquist rate.

10. A system according to any one of claims 6 to 9, further including compression means located in the head-end station and expansion means located in the or each receiver and arranged to apply complementary compression and expansion to the composite analogue signals.

9. A method of distributing signals substantially as described with respect to the accompanying drawings.

10. A system for distributing signals substantially as described with respect to the accompanying drawings.

11. A method or system according to any one of the preceding claims, in which the signals distributed from the head-end station are television signals.

SUBSTITUTE SHEET

Fig.1.

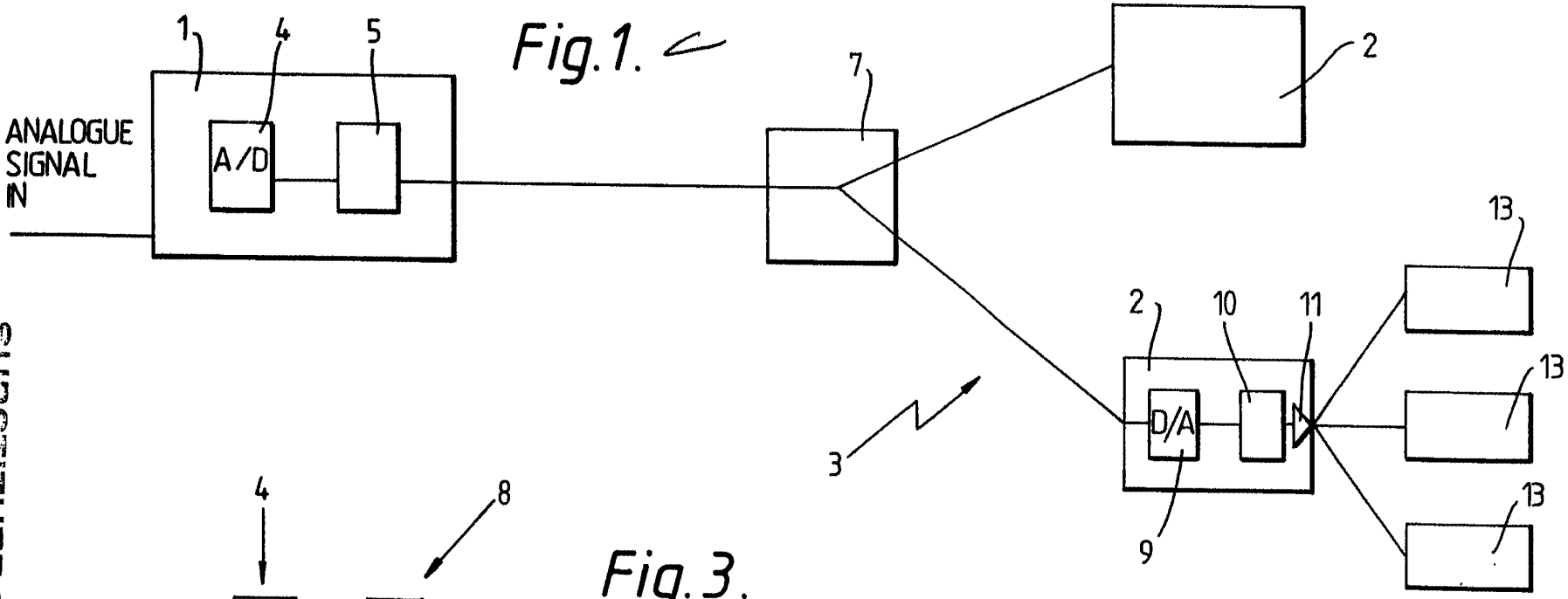
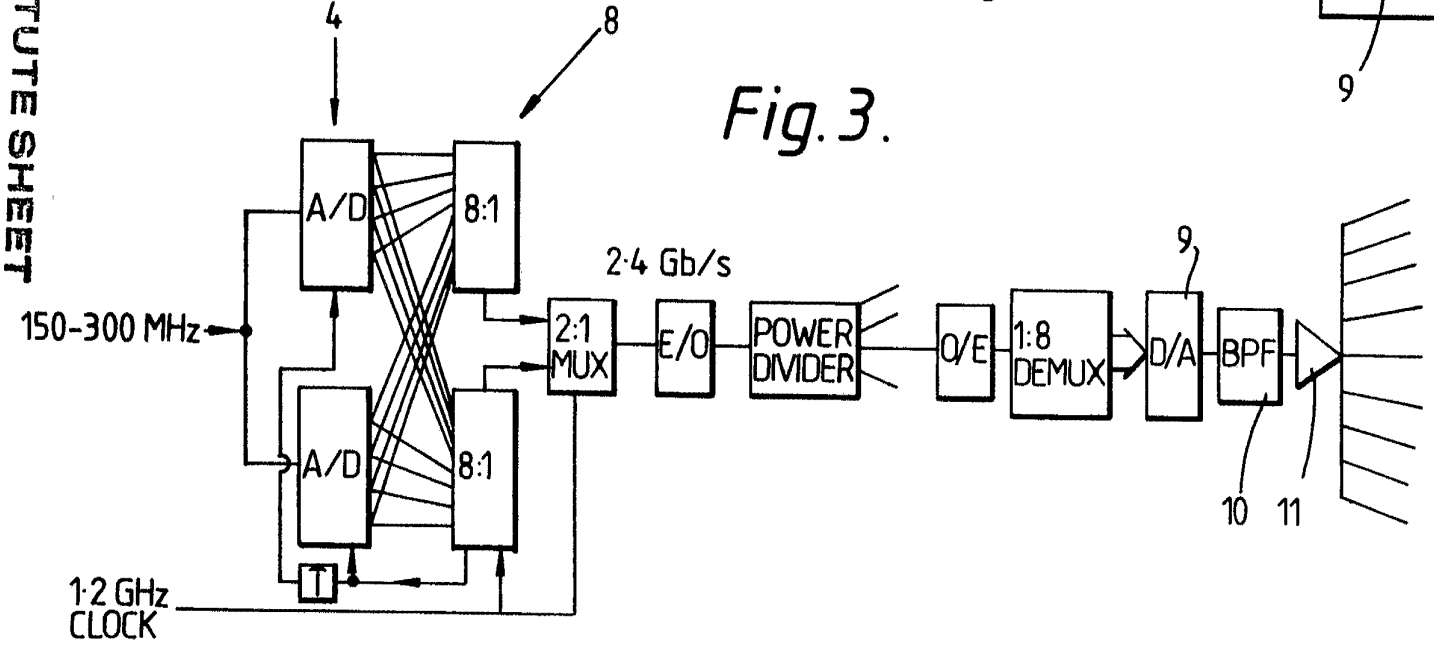


Fig.3.



SOLiD Ex. 1006
Page 117

Fig. 2.

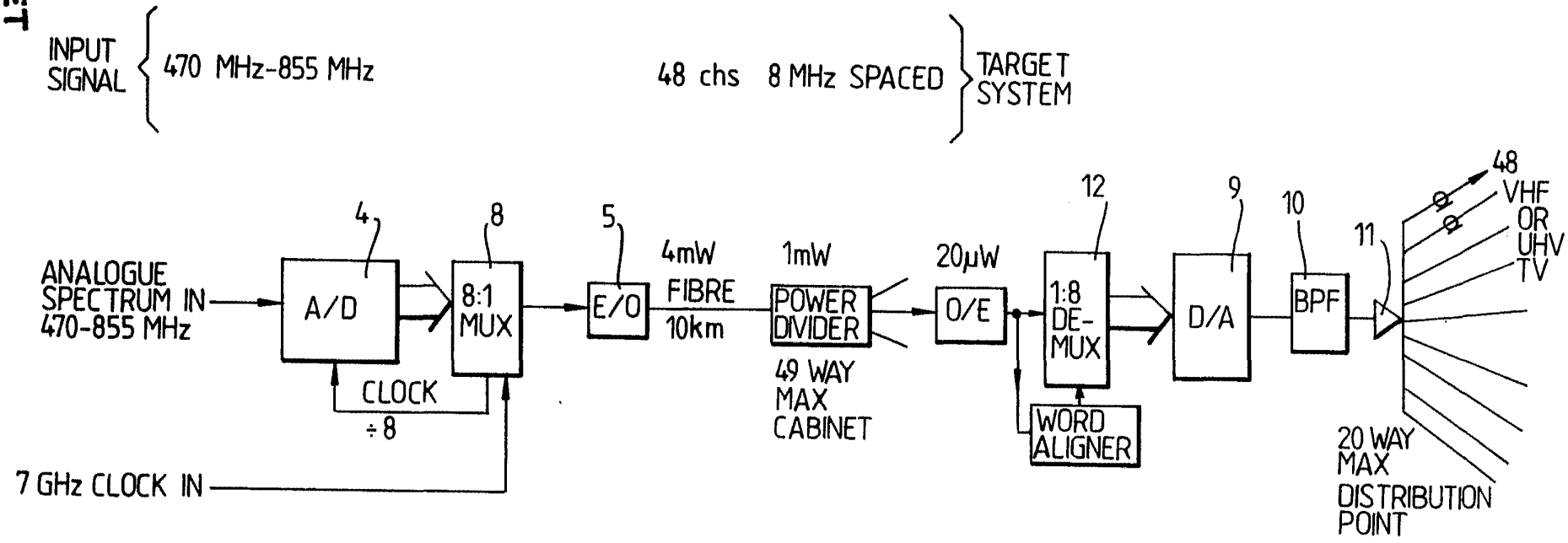
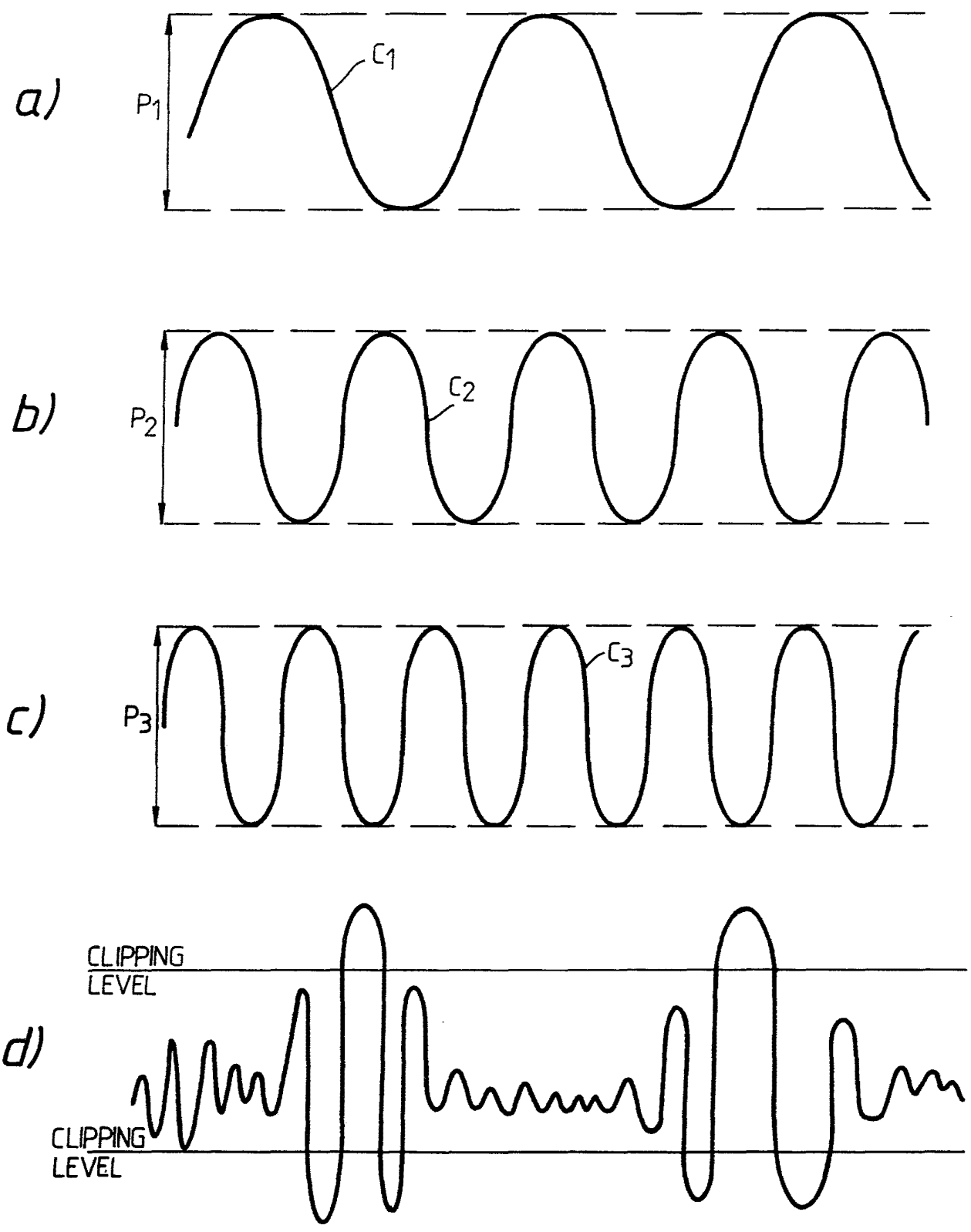

INPUT SIGNAL
470 MHz-855 MHz
48 chs 8 MHz SPACED
TARGET SYSTEM
ANALOGUE SPECTRUM IN 470-855 MHz
A/D
4
8:1 MUX
8
CLOCK ÷8
7 GHz CLOCK IN
E/O
5
4mW
FIBRE 10km
1mW
POWER DIVIDER
49 WAY MAX CABINET
20μW
O/E
1:8 DE-MUX
12
WORD ALIGNER
D/A
9
BPF
10
11
48 VHF OR UHV TV
20 WAY MAX DISTRIBUTION POINT

Fig.4.



INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 91/00568

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: H 04 N 7/22

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	H 04 N

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	Symposium Record, CATV sessions 16th International TV Symposium, Montreux, 17-22 June 1989, H.H. Tan et al.: "CATV distribution over a fibre optic local network", pages 262-272 see abstract; page 266, lines 1-10 ---	1,2,6-8,11
A	Funkschau, volume 62, no. 1, 29 December 1989/90, (Munich, DE), M.Gendisor et al.: "Signale auf der Glasfaser", pages 51-55 see page 54, right-hand column, line 46 - page 55, left-hand column, line 5 ---	1-3,6-8, 9-11
A	Conférence Européenne sur les Communications Optiques, Cannes, 21-24 September 1982, E. Roza et al.: "TV system with remote selection for subscriber glass fiber networks", pages 497-500 see page 499, left-hand column, lines 17-37; figure 1 ---	1-3,6-8, 9-11

./.

* Special categories of cited documents: [10]

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
19th June 1991	24 JUN 1991
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	MISS T. TAZELAAR

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	Electronics Letters, volume 24, no. 7, 31 March 1988, (Stevenage, Herts, GB), F.V.C. Mendis et al.: "20 Km single-mode optical fibre system for multichannel video", pages 442-443 see page 442, left-hand column, lines 16-28 ---	1-4,6-11
A	Patent Abstracts of Japan, volume 10, no. 363 (E-461)(2420), 5 December 1986, & JP, A, 61158281 (MATSUSHITA ELECTRIC IND. CO. LTD.) 17 July 1986	1-11

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S122	1	10/740944	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/22 10:31
S123	2	"6704545".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/22 10:32
S124	19	("4760573" | "5603080" | "5621786" | "5627879" | "5642405" | "5644622" | "5657374" | "5765097" | "5765099" | "5774789" | "5852651" | "5878325" | "5946622" | "5969837" | "6112086" | "6147786" | "6198558" | "6362908" | "6486907").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/01/22 10:32
S125	6	08/650683	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/22 11:13
S126	26	("5765097"). URPN.	USPAT	OR	ON	2009/01/22 13:06
S127	6	"6697603".pn. "6262981".pn. "6480551".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/22 13:21

S128	3	"6801767".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/22 13:26
S129	2	"6005884".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/22 13:28

1/22/09 3:01:29 PM

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	10740944
Filing Date	2003-12-19
First Named Inventor	Wala
Art Unit	2618
Examiner Name	D Nguyen
Attorney Docket Number	100.019US02

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/D.N./	1	4611323		1986-09-09	Hessenmiiller	
/D.N./	2	4628501		1986-12-09	Loscoe	
/D.N./	3	4654843		1987-03-31	Roza et al.	
/D.N./	4	4691292		1987-09-01	Rothweiler	
/D.N./	5	4813054		1980-01-08	Patisaul et al.	
/D.N./	6	4999831		1991-03-12	Grace	
/D.N./	7	5193109		1993-03-09	Chien-Yeh Lee	
/D.N./	8	5243598		1993-09-07	Lee	

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	Filing Date	2003-12-19
	First Named Inventor	Wala
	Art Unit	
	Examiner Name	
	Attorney Docket Number	100.019US02

/D.N./	9	5321849		1994-06-14	Lemson	
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/D.N./	1	0391597	EP		1990-10-10	CHU		☐
/D.N./	2	9115927	WO		1991-10-17	Cook et al.		☐

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/D.N./	1	GRACE, MARTIN K., "Synchronous Quantized Subcarrier Multiplexing for Transport of Video, Voice and Data", "IEEE Journal on Selected Areas in Communications", Sept. 1990, Page(s) 1351-1358, Volume 8, Number 7, Publisher: IEEE	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	10740944
	Filing Date	2003-12-19
	First Named Inventor	Wala
	Art Unit	2618
	Examiner Name	Nguyen
	Attorney Docket Number	100.019US02

/D.N./	2	HARVEY ET AL., "Cordless Communications Utilising Radio Over Fibre Techniques for the Local Loop", "IEEE International Conference on Communications", , Page(s) 1171-1175, Publisher: IEEE	☐

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Examiner Signature	/Duc Nguyen/	Date Considered	02/19/2009

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	Art Unit
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008	02/19/2009						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
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	8	✓	✓	✓						
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	36	✓	✓	✓						

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	Examiner	Art Unit
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	37	✓	✓	✓						
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	Art Unit
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

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CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008	02/19/2009						
	73	O	=	=						
	74	=	=	=						
	75	✓	✓	✓						
	76	✓	✓	✓						
	77	✓	✓	✓						
	78	✓	✓	✓						
	79	✓	✓	✓						
	80	✓	✓	✓						
	81	✓	✓	✓						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
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	DUC M NGUYEN	2618

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Class	Subclass	Date	Examiner
455	7, 14-22, 553, 561, 3.01, 3.05	8/10/06	DN
370	906, 907, 498, 501, 535-537	8/10/06	DN
Updated	same as aboves	1/25/07	DN
		9/25/07	DN
		10/6/08	DN
		2/18/09	DN

SEARCH NOTES

Search Notes	Date	Examiner
see EAST search history	8/10/06	DN
	8/17/06	DN
	1/25/07	DN
	4/24/07	DN
	7/29/07	DN
	1/22/09	DN

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

	/DUC M NGUYEN/ Primary Examiner.Art Unit 2618

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	10740944
Filing Date	2003-12-19
First Named Inventor	Wala
Art Unit	
Examiner Name	
Attorney Docket Number	100.019US02

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	1	4611323		1986-09-09	Hessenmiiller	
	2	4628501		1986-12-09	Loscoe	
	3	4654843		1987-03-31	Roza et al.	
	4	4691292		1987-09-01	Rothweiler	
	5	4813054		1980-01-08	Patisaul et al.	
	6	4999831		1991-03-12	Grace	
	7	5193109		1993-03-09	Chien-Yeh Lee	
	8	5243598		1993-09-07	Lee	

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	9	5321849		1994-06-14	Lemson	
	10	5339184		1994-08-16	Tang	

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	1	0391597	EP		1990-10-10	CHU		☐
	2	9115927	WO		1991-10-17	Cook et al.		☐

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	1	GRACE, MARTIN K., "Synchronous Quantized Subcarrier Multiplexing for Transport of Video, Voice and Data", "IEEE Journal on Selected Areas in Communications", Sept. 1990, Page(s) 1351-1358, Volume 8, Number 7, Publisher: IEEE	☐

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	2	HARVEY ET AL., "Cordless Communications Utilising Radio Over Fibre Techniques for the Local Loop", "IEEE International Conference on Communications", , Page(s) 1171-1175, Publisher: IEEE	☐

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	Attorney Docket Number	100.019US02

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jon M. Powers/	Date (YYYY-MM-DD)	2009-01-14
Name/Print	Powers, Jon M.	Registration Number	43868

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	10740944	Filing Date	2003-12-19	Docket Number (if applicable)	100.019US02	Art Unit	2618
First Named Inventor	Wala			Examiner Name	Duc Nguyen		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 502432

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

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Signature of Registered U.S. Patent Practitioner			
Signature	/Jon M. Powers/	Date (YYYY-MM-DD)	2009-01-14
Name	Jon M. Powers	Registration Number	43868

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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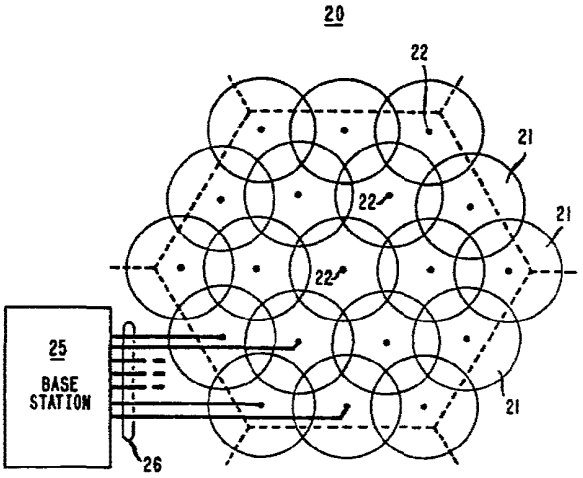
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(54) Optical fiber microcellular mobile radio.

(57) A microcellular communication system includes optical fiber connections (26) between a base station (25) and opto-RF transducers (22) located in a closely spaced grid. Radio-band signals are modulated directly onto laser outputs through the optical fibers for both transmission to mobile units or from the mobile units. The opto-RF transducers, housed in canisters, are mounted on telephone or power poles to provide radio link coverage to mobile and portable phones located in a microcell area, e.g., in a congested metropolitan area where space for a roof-top base station is very limited and expensive.

FIG. 1



EP 0 391 597 A2

OPTICAL FIBER MICROCELLULAR MOBILE RADIO

This invention relates to a mobile radio system having a plurality of cells which reuse transmitting carrier frequencies.

Background of the Invention

There is an ever increasing demand for more capacity in cellular mobile radio. In the current 900 MHz, UHF cellular systems, only 20 MHz are available for each direction of transmission between a base station and mobile units. By separating the overall 20 MHz band into a number N of sub-bands and assigning each sub-band to a different set of geographical cells in a regular array of cells which cover a large region, the frequencies are reused. Co-channel interference is minimized by assuring that the ratio of cell radius to the distance to the next cell which uses the same frequency sub-band is small. In the regular pattern of cells, this ratio is made smaller by increasing the number N and is independent of the absolute cell size used in the pattern. Typically, the number N = 21, which assures negligible co-channel interference and allows 16 channels per sub-band. By making the scale of the pattern smaller, more users per square mile are accommodated with the same overall bandwidth.

Previously, cellular radio system operators have increased capacity by subdividing the cell area and reusing assigned frequencies in closer geographic areas. Whereas a typical cell radius is eight miles, subdivisions down to a cell radius of one mile or smaller are often needed. In such small cell areas, appropriate choices of base station locations become very restricted because public facilities may not be available where needed, and private locations are likely to be prohibitively expensive. For many small cells, a residential location may be the only available choice. People in residential areas often object to the base station antenna tower because its height, typically 100 to 150 feet, makes it an eyesore; and its radiated power, typically 400 to 1,200 watts, is perceived to be an environmental health hazard.

Another problem arises when one considers the use of not yet allocated bandwidth in the 10 to 60 GHz, or millimeter wave, frequency spectrum for providing very large capacity mobile communication service. Propagation loss and Doppler frequency shifts are more severe for millimeter waves than for the currently used UHF signals. The increased Doppler shift requires each channel to use more bandwidth than at the channels in UHF systems. To fully utilize the bandwidth in the 10 to 60 GHz frequency range, with time division multiplexing for example, it is necessary to minimize the the spread in time delays. To reduce propagation loss and the spread in time delays, any millimeter wave mobile radio system design must strongly favor line of sight operation.

The above problems of mobile radio need base station antennas to be placed geographically very close to the mobile units, but the conventional means of carrying the signals between the base station and remote antennas by means of coaxial RF transmission lines is prohibitively expensive because of their large transmission losses.

Summary of the Invention

The above problems are solved in accordance with the present invention by placing many antennas, associated with a single base station, at grid points near the mobile units and using an optical fiber network for interconnecting the antennas with the base station. Optical wavelength carriers are analog modulated with multiplexed RF mobile radio channels for transmission through the optical fiber network. The modulated optical wavelength carriers are analog detected from the optical fibers so that the RF channels are distributed to the grid of antennas without distortion. Received RF channels also are collected from the grid of antennas for modulating laser outputs which are transmitted through the optical fibers to the base station.

Brief Description of the Drawing

A better understanding of the invention may be obtained by reading the subsequent detailed description with reference to the drawing wherein:

FIG. 1 shows a grid of microcell opto-RF transducer radiation and reception coverage of a mobile radio cell;

FIG. 2 is a schematic diagram of an optical fiber distribution network between a mobile radio base station and opto-RF transducers with a separate fiber for each direction of optical transmission for each transducer;

FIG. 3 is a schematic diagram of an alternative opto-RF transducer for operation with a separate fiber for each direction of optical transmission;

FIG. 4 is a schematic diagram of an optical fiber distribution network between a mobile radio base station and opto-RF transducers with a separate fiber providing bidirectional optical transmission for each transducer;

FIG. 5 is a schematic diagram of an alternative opto-RF transducer for operation with a fiber providing bidirectional optical transmission;

FIG. 6 is a schematic diagram of an optical fiber distribution network between a mobile radio base station and a group of opto-RF transducers wherein a single optical detector receives all signals through a fiber from a group of the opto-RF transducers and wherein a single laser transmits through another fiber to all of the opto-RF transducers in that group; and

FIG. 7 is a schematic diagram of an optical fiber distribution network between a mobile radio base station and a group of opto-RF transducers wherein all optical signals pass through a single optical fiber.

Detailed Description

Referring now to FIG. 1, there is shown a mobile telecommunication cell 20 generally bounded by a heavy dotted line. Adjacent cells are only indicated in part. In the prior art, a base station is located within and serves that cell 20. That base station transmits to and receives from mobile units some number of frequency multiplexed information channels. A typical base station handles sixteen separate channels for reception and transmission. Multiplexed signals developed within the base station are fed via coaxial cable to an antenna located effectively at the center of the cell. That antenna radiates the multiplexed signals to mobile units within or near the cell 20.

Those mobile units receive the radiated signal and separate their assigned channels. Concurrently each of the mobile units transmits a channel to the base station antenna. All of the channels transmitted from the mobile units are multiplexed in the air and at the antenna. This multiplexed signal is transmitted from the antenna through a coaxial cable to the base station where the various channels are separated and the voice signals detected for delivery to a central office.

In our new arrangement, radiation coverage of the cell 20 is accomplished in an entirely different manner. Several microcell opto-RF transducers 22 are positioned within the cell 20 so that the entire cell area is covered in an over-lapping grid-like microcell pattern of radiation 21 of the same RF signals from the transducers 22. A base station 25 may be located within the cell 20 but more generally can be located outside of the cell. The transducers 22 are interconnected with the base-station 25 via a network of optical fibers 26.

Mobile units within the cell 20 communicate by way of two way radio signals to the transducers 22. All sixteen channels being transmitted from the base station 25 are distributed to all of the transducers. Also all sixteen channels can be received from the mobile units at any of the transducers and are transmitted via the optical fibers 26 to the base station 25. Thus the transducers act as a grid-like distributed antenna for both transmitting and receiving the frequency division multiplex signals.

Referring now to FIG. 2, there is shown a detailed block diagram of the base station 25 which is arranged to transmit and receive frequency multiplexed FM signals in several channels. On the transmit side of the base station, the FM subcarrier channels, frequency multiplexed on a radio frequency transmission line, are applied to a star splitter, or power splitter, 30. At each of the output ports of the power splitter, the signal modulates a laser 32 for transmitting the frequency multiplexed channels on an optical carrier through an optical fiber 26. The opto-RF transducers 22 include an optical detector 27 for converting the optical signal to an electrical radio frequency signal which is amplified if required and is used for radiating from an antenna 35 to the mobile units within range. Only one opto-RF transducer is shown in detail but others are indicated by a separate block 22 and two series of dots.

In response to the radiated signals, the receiving mobile units transmit a radio frequency signal which is received by an antenna 37 of the opto-RF transducer 22. The received radio frequency signal is amplified, if required, and modulates a laser 38 that produces an optical signal which is transmitted through another optical fiber 30 to the base station 25. This optical signal includes frequency division multiplexed signals from all mobile units transmitting within the relevant microcell. At the base station, an optical detector 40 converts the optical signal to an electrical signal and applies it to an input port of a star coupler, or power combiner, 41. At the output port of the power combiner, the electrical signal, including sixteen FM channels, is fed into the base station in accordance with prior art techniques.

Referring now to FIG. 3, there is shown an alternative opto-RF transducer 42 which may be substituted for the opto-RF transducer 22 of FIG. 2. It is noted that the opto-RF transducer 42 also interconnects with two optical fibers 26 and 30, each of which transmits optical signals in one direction. Detector 27 and laser 38 perform the same functions as in FIG. 2. Electrical signals, in an RF band $\lambda 1$, from the detector 27, however, are applied to a port of a circulator 43 which directs them to an antenna 45 for radiating to the mobile units within the microcell.

Electrical signals, in a different RF band f2 and radiated back from the mobile units, are received by the same antenna 45 in the opto-RF transducer

SOLiD Ex. 1006
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42. The electrical signals are applied to the circulator 43 which directs them to the laser 38. These electrical signals, received from the antenna 45, are amplified if required. As in the arrangement of FIG. 2, the laser output signal is modulated by the frequency multiplexed FM signals in several channels.

Referring now to FIG. 4, there is shown a detailed block diagram of a mobile radio base station 25 which is arranged to transmit and receive frequency multiplexed FM signals in several channels. On the transmit side of the base station 25, the FM subcarrier channels, frequency multiplexed on a radio frequency transmission line, are applied to a star splitter, or power splitter 30. At each of the output ports of the power splitter, the signal modulates a laser 52 for transmitting the frequency multiplexed channels on an optical carrier $\lambda 1$ through an optical fiber 53 to a wavelength multiplexer 54. The multiplexed optical carrier is directed by the multiplexer 54 to an optical fiber 55. An opto-RF transducer 62 includes a wavelength multiplexer 56 and an optical detector 57 for converting the optical signal on the fiber 55 to an electrical radio frequency signal which is radiated from an antenna 60 at a power, limited to approximately ten watts for the combined carriers, to mobile units within a microcell range of the antenna. The electrical signal is amplified by an amplifier 59 if required. Radiation from the antenna 60 is in a first band f1 of RF frequencies and, typically, may be at one watt for the combination of carriers.

In response to those transmitted signals, the receiving mobile units transmit a radio frequency signal which is received by an antenna 61. The received radio frequency signal is in a second band of frequencies which are separated from and do not interfere with the first band of frequencies. When received at the antenna 61, the radio frequency signal is amplified by an amplifier 63, if required, and modulates a laser 64 that produces an optical signal at a wavelength $\lambda 2$ which is transmitted through the wavelength multiplexer 56 to the optical fiber 55. This optical signal includes frequency multiplexed signals received from all mobile units transmitting within the relevant microcell. Thus, optical carrier signals of different wavelengths $\lambda 1$ and $\lambda 2$ are transmitted in opposite directions on the single fiber 55. RF carriers are multiplexed onto both optical carriers.

At the base station location, the wavelength multiplexer 54 directs the optical signal wavelength $\lambda 2$ to an optical detector 66. Such detector converts the optical signal to an electrical signal and applies it to an input port of a star coupler, or power combiner, 41. At the output port of the power combiner, the electrical signal including sixteen FM channels is fed into the base station 25 in accordance with known techniques.

Referring now to FIG. 5, there is shown an alternative opto-RF transducer 72 which can be substituted for the transducer 62 of the arrangement of FIG. 4. It is noted that the single optical fiber 55, which transmits optical carriers in both directions, applies the wavelength $\lambda 1$ to the wavelength multiplexer 56 and receives the wavelength $\lambda 2$ from the wavelength multiplexer 56. Optical detector 57 and laser 64 operate as in the arrangement of FIG. 4. Electrical signals including the combined RF carriers detected from the optical carrier $\lambda 1$ are amplified, if required, by an amplifier 68 and are applied to a circulator 68. Those RF channels, which have a combined power limited to approximately ten watts, are directed to an antenna 70 for radiation to mobile units within a microcell range of the antenna. These RF channels are in a first RF band of frequencies f1.

RF channel signals returned from the mobile units are received at the same antenna 70 and are applied to the circulator 69. These RF channels are transmitted in a separate RF band of frequencies f2 which does not interfere with the band of frequencies that is transmitted from he antenna 70. Circulator 69 directs the received RF channels to the laser 64. The signals are amplified in an amplifier 71, if required.

Thus the opto-RF transducer 72 is arranged to interconnect with a single optical fiber carrying two different wavelength optical carriers for opposite directions of transmission and to include a single antenna arranged for radiating and receiving RF channels in different frequency bands f1 and f2. For the transmitted RF channels, their combined power typically is approximately one watt and is limited to approximately ten watts to produce the microcell coverage. RF signals, received from mobile units is at typical mobile unit power level.

Referring now to FIG. 6, there is shown the base station 25 which is arranged to transmit and receive frequency multiplexed FM signals in several channels. On the transmit side of the base station, the FM sub carrier channels, frequency multiplexed on a radio frequency transmission line, are used for modulating a laser 75 for transmitting the frequency multiplexed channels on an optical carrier through an optical fiber 76. The optical signal is applied to a star coupler 80 for distribution through optical fibers 81 to opto-RF transducers 82. The star coupler 80 can be located remote from he base station 25. In those opto-RF transducers, a detector 83 converts the optical signal to an electrical radio frequency signal which is used for radiating from each antenna 87 to mobile units located within microcell range. Transmitted radio frequency signals include several channels in a first

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band of frequencies. The radiated power is limited to approximately ten watts for the combined channels. Typically the combined power is approximately one watt for each microcell.

Responding mobile units transmit radio frequency signals which are received by any microcell antenna 89 that is within microcell range. Channel signals transmitted from the mobile units are multiplexed in air and at the antenna 89. They are in a different band of frequencies than the band transmitted from the antenna 87. The received radio frequency signal modulates a laser 90 producing an optical signal that is transmitted through another optical fiber 92 to a star coupler, or power combiner, 95. Optical signals from the several fibers 92 are combined and transmitted through a single optical fiber 97 to a detector 98 at the location of the base station 25. The optical signal includes frequency division multiplexed signals from all mobile units transmitting within relevant microcells. Power levels received from he mobile units are typical for mobile radio units.

At the base station location, the detector 98 converts the optical signal to an electrical signal including sixteen FM channels and applies that signal to the base station 25, in accordance with standard techniques. Opto-RF transducer 42 from FIG. 3 can be substituted for opto-RF transducer 82 for operating with a single antenna.

Referring now to FIG. 7, there is shown the base station 25 arranged for transmitting and receiving frequency multiplexed FM signals in many channels. To transmit, the FM subcarrier channels, frequency multiplexed on a radio frequency line, are used for modulating the output of a laser 102. The laser 102 transmits the frequency multiplexed channels on an optical carrier through a wavelength multiplexer 103 and an optical fiber 104. The optical carrier for the signal being transmitted is at a wavelength $\lambda 1$. From the fiber 104, the optical signal is applied to a port of a star coupler, or power splitter 105. The star coupler 105 can be located remote from the base station 25. Each of several output ports of the power splitter 105 connects with a separate optical fiber 106 for distributing the optical signal to a group of opto-RF transducers 107. Such transducers include a wavelength multiplexer 108 for directing the optical carrier to $\lambda 1$ an optical detector 109 for converting to an electrical radio frequency signal that is radiated from the group of antennas 110 to any mobile units within range of the microcell radiation coverage. Combined channel power is limited to approximately ten watts and typically is approximately one watt for covering a microcell.

Concurrently the mobile units transmit back to the base station 25 via a radio frequency signal that is received at one or more antennas 112 and is applied to modulate a laser 115 in the opto-RF transducer 107. This radio frequency signal is a combination of channels in a band of frequencies that is different from the band radiated from antenna 110. The optical carrier, modulated by the received radio frequency signal, is transmitted through the optical fibers 106 to the star coupler 105. This receiving optical carrier has a wavelength $\lambda 2$ that is separate from the transmitting optical carrier so that the two optical carriers do not interfere with each other. Optical signals from all of the fibers 106 are added incoherently within the star coupler 105 and the resulting composite optical signal is transmitted through the optical fiber 104 to the wavelength multiplexer 103 where it is directed to the receiving port of the base station 25. At the base station location, the optical signal is detected in a detector 117 and is converted to a sixteen channel electrical signal that is applied to the base station 25 according to known practice.

Although the foregoing embodiments have been described as an example with sixteen channel operation, the invention also is well suited for a mobile communication network that operates with many more than sixteen channels from a base station.

Microcell radiation coverage is much more precisely defined than that of presently used base station antenna towers. As a result the number N of sub-bands can be greatly reduced with microcells because of reduced co-channel interference. This results in more frequency channels per sub-band and allows more users per square mile and greater frequency reuse. Since microcells in a given call radiate and receive the same sub-band, there is no call handoff between microcells only at the regular cell boundaries.

The fibers connecting the microcells to the base station can be reconnected at the base station to a multiple of new sub-band transceivers. This provides the ability to sub-divide a cell into multiple channel sub-cells by reconfiguring the fiber network to the opto-RF transducers. This aspect of the invention overcomes the difficulty of installing new base stations and antenna towers when sub-dividing cells.

Appended claims define the described embodiments of the invention together with other embodiments which are obvious in view thereof.

Claims

1. A mobile radio system having a base station (25) and a plurality of mobile units, CHARACTERIZED BY

a plurality of opto-RF transducers (22),

a distribution network using optical fibers (26,39)

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interconnecting the base station with the opto-RF transducers, and

means (32,27,38,40) for transducing multiplexed subcarrier channels onto and off optical carriers in the fiber distribution network, for transducing multiplexed subcarrier channels onto an optical carrier on a fiber from the base station, and for transducing multiplexed subcarrier channels off an optical carrier on a fiber to the base station.

2. A system as claimed in claim 1, wherein the plurality of opto-RF transducers, in response to optical signals on the fibers, serves to radiate radio signals to mobile units and, in response to received radio signals transmitted from the mobile units, serves to modulate optical signals on at least one fiber for transmission to the base station.

3. A system as claimed in claim 2, wherein the radiated and received radio signals lie in a millimeter wave band.

4. A system as claimed in claim 2 or 3 wherein received radio signals are added together incoherently in the distribution network to provide the combined signal at the base station.

5. A system as claimed in claim 1, wherein the sub-carrier transducing means and the opto-RF transducers serve to time division multiplex channels onto the optical carrier in the fiber distribution network.

6. A system as claimed in claim 1, wherein the subcarrier transducing means and the opto-RF transducers serve to frequency multiplex channels onto the optical carrier in the fiber distribution network.

7. A mobile radio microcell transducer arrangement (22) CHARACTERIZED BY

a first antenna (35) for transmitting radio signals including multiplexed mobile radio channels in a first range of frequencies,

a second antenna (37) for receiving radio signals including multiplexed mobile radio channels in a second range of frequencies,

a laser (38), responsive to the received radio signals, for producing an optical carrier modulated by the mobile radio channels in the second range of frequencies, and

means (27) for transducing another optical carrier modulated by the mobile radio channels in the first range of frequencies into an electrical signal including the mobile radio channels having a combined power of ten watts or less.

8. A transducer as claimed in claim 7, including a first optical fiber (39) for receiving the modulated optical carrier produced by the laser (38); and

a second optical fiber (26) for applying another modulated optical carrier to the transducing means (27).

9. A mobile radio microcell transducer arrangement (42) CHARACTERIZED BY

a laser (38),

an antenna (45) for transmitting and receiving radio signals including multiplexed mobile radio channels in different ranges of frequencies,

means (27) for converting an optical carrier modulated with mobile radio channels in a first band of frequencies into an electrical signal to be applied to the antenna, and

circulator means (43) for coupling the electrical signal in the first band of frequencies to the antenna for radiating to mobile units and for coupling an electrical signal, received in a second band of frequencies from the mobile units through the antenna, to the laser for modulating the optical output with the electrical signal in the second band of frequencies.

10. An arrangement as claimed in claim 9, including

a first optical fiber (39) for receiving the electrical signal modulated laser output; and

a second optical fiber (26) for applying the mobile radio channels modulated optical carrier to the converting means (27).

11. A mobile radio microcell transducer arrangement (62) CHARACTERIZED BY

a first antenna (60) for transmitting radio signals including multiplexed mobile radio channels in a first range of frequencies,

a second antenna (61) for receiving radio signals including multiplexed mobile radio channels in a second range of frequencies,

laser means (64), responsive to the received radio signals, for producing an optical carrier modulated by the mobile radio channels in the second range of frequencies,

means (57) for transducing another optical carrier modulated by the mobile radio channels in the first range of frequencies into an electrical signal including the mobile radio channels;

an optical fiber (55), and

means (56) for optical wavelength multiplexing a first optical wavelength (λ_1) from the optical fiber to the transducing means,

and for wavelength multiplexing a second optical wavelength (λ_2) from the laser means to the optical fiber.

12. A mobile radio microcell transducer arrangement (72) CHARACTERIZED BY a laser (64);

an antenna (70) for transmitting and receiving radio signals including multiplexed mobile radio channels in different ranges of frequencies,

means (57) for converting an optical carrier modulated with mobile radio channels in a first band of frequencies into an electrical signal to be applied to the antenna,

circulator means (69) for coupling the electrical signal in the first band of frequencies to the antenna for radiating to mobile units and for coupling

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an electrical signal, received in a second band of frequencies from the mobile units through the antenna, to the laser for modulating the optical output with the electrical signal in the second band frequencies,
an optical fiber (55),
and means (M) for wavelength multiplexing a first optical wavelength (λ_1) from the optical fiber to the converting means, and
for wavelength multiplexing a second optical wavelength (λ_2) from the laser means to the optical fiber.

13. An arrangement as claimed in any one of claims 9 to 12 wherein, in operation,
the electrical signal applied to the antenna has a combined channel power of ten watts or less.

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FIG. 1

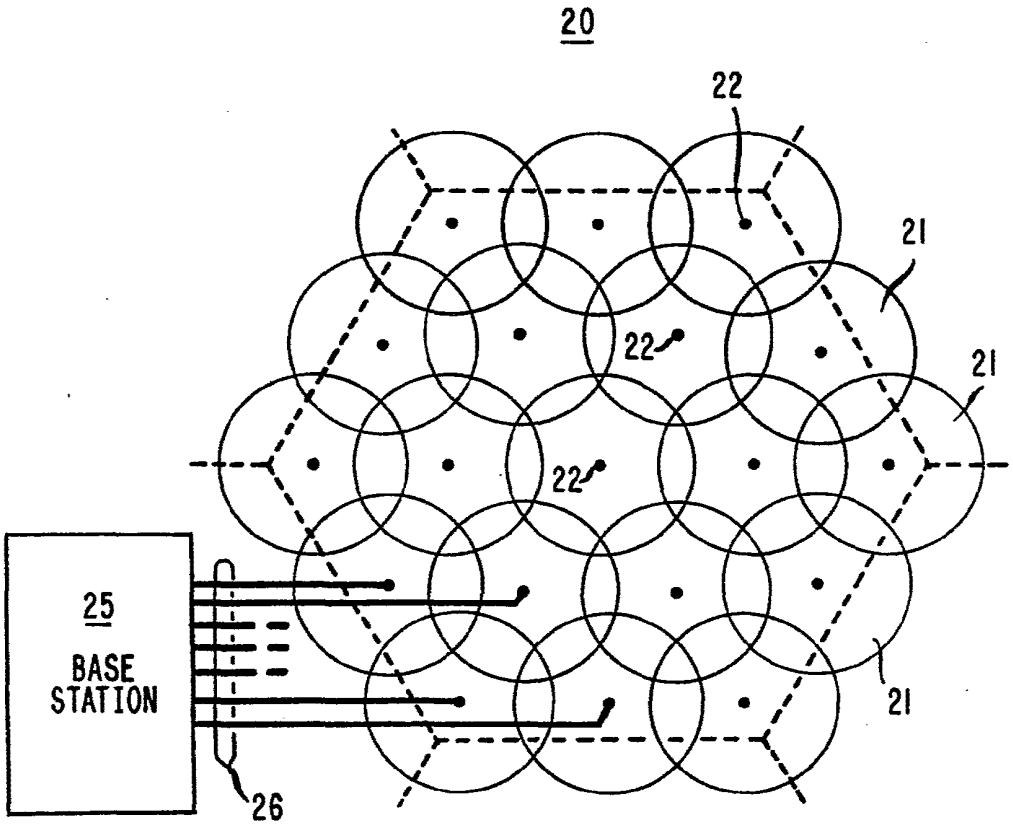
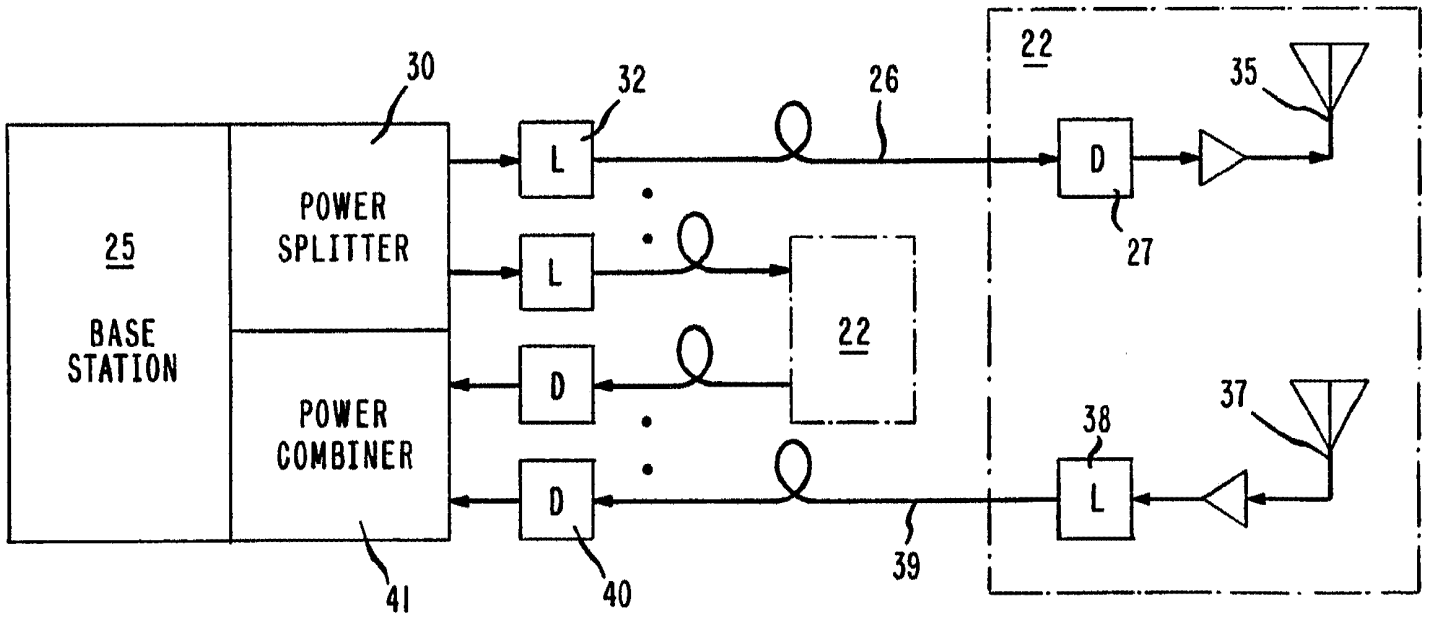


FIG. 2



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FIG. 3

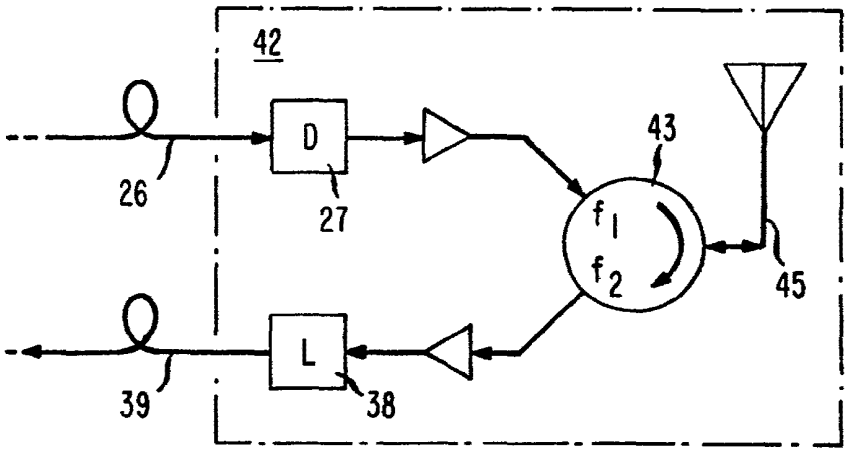

42
D
26
27
43
f_1
f_2
45
L
39
38

FIG. 5

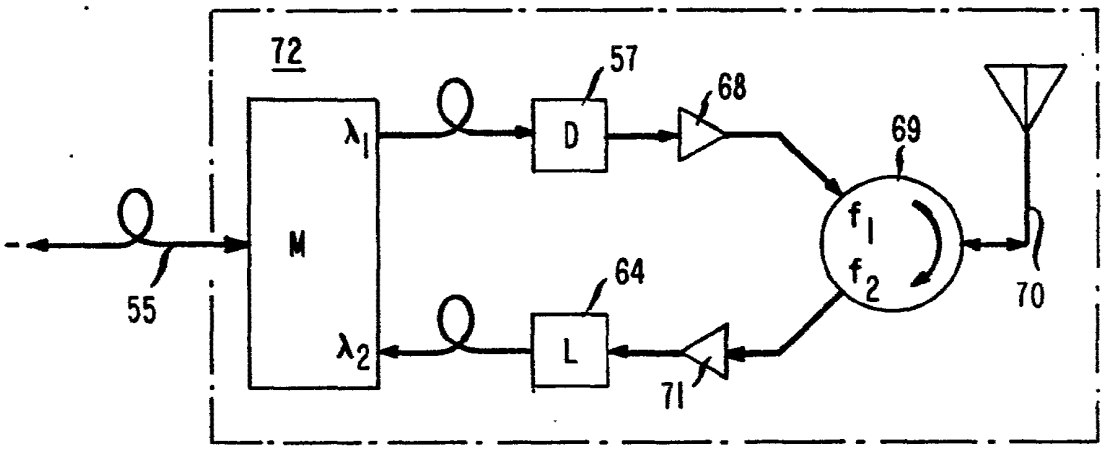
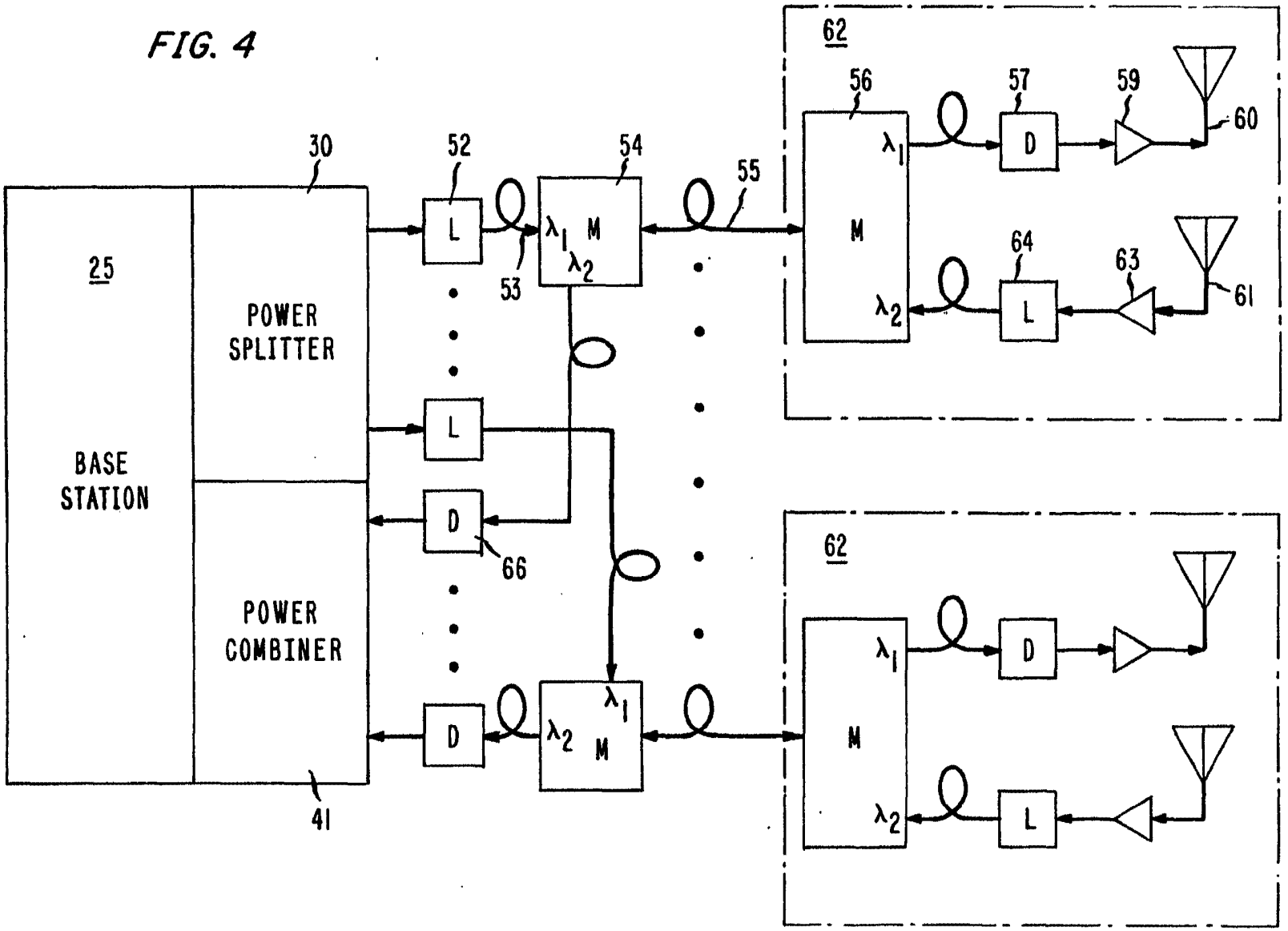
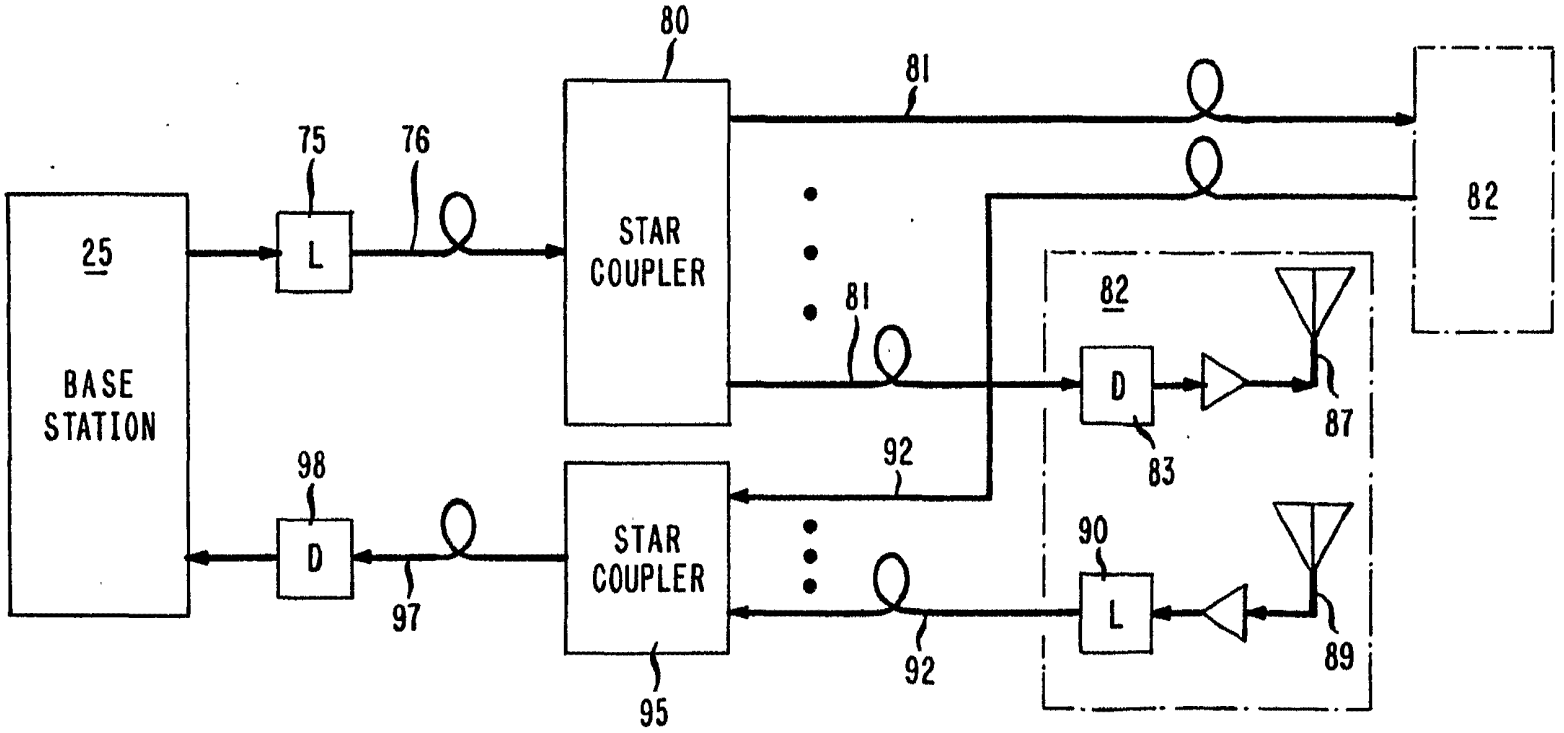

72
57
68
69
λ_1
D
M
f_1
f_2
70
55
64
λ_2
L
71

FIG. 4



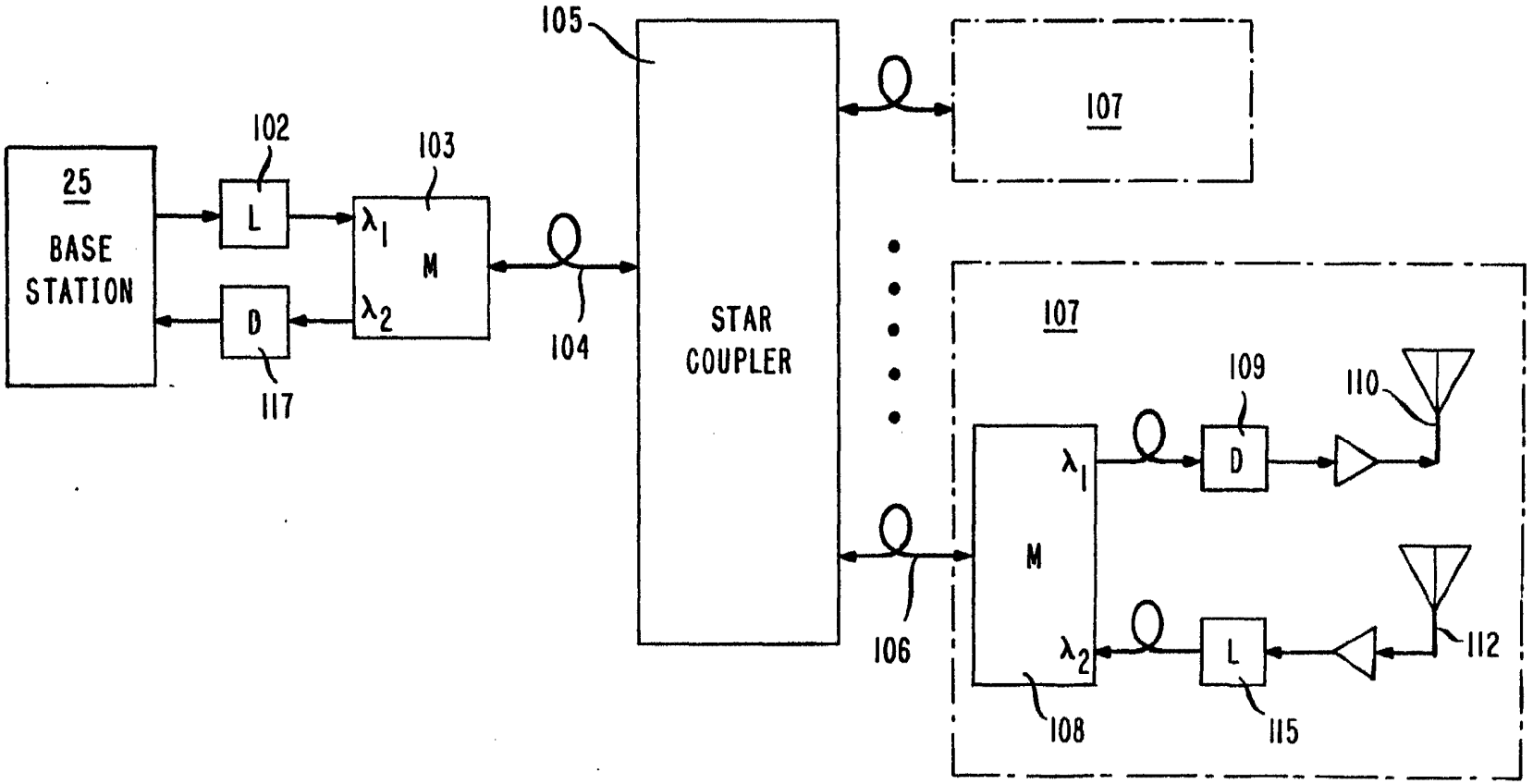
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FIG. 6



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FIG. 7



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Electronic Patent Application Fee Transmittal

Application Number:	10740944
Filing Date:	19-Dec-2003
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Filer:	Jon M. Powers/Lisa Gentry
Attorney Docket Number:	100.019US02

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	810	810
		Total in USD ($)		**810**

Electronic Acknowledgement Receipt

EFS ID:	4610354
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	14-JAN-2009
Filing Date:	19-DEC-2003
Time Stamp:	15:50:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$810
RAM confirmation Number	1426
Deposit Account	502432
Authorized User	POWERS,JON M.

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		00149322.PDF	156279 2acf526caa9620954f63b91402a982c137dcbb42	yes	30
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	23	
	Applicant Arguments/Remarks Made in an Amendment		24	30	
Warnings:					
Information:					
2	Foreign Reference	00147199.PDF	695262 08d78d11e6e7501812bc967fb9a0bc0a2eeafc57	no	17
Warnings:					
Information:					
3	NPL Documents	00147189.PDF	418801 6c1ca1b0728bd2b62078a1a651705e2aedf90eaa	no	5
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Filed (SB/08)	00149327.PDF	859376 9a987ad8aa9b6157fba676d3deff96a769cde2ff	no	5
Warnings:					
Information:					
5	Request for Continued Examination (RCE)	00149326.PDF	768421 b6123b2204dfd56baa0dfc7a21461d04faa65b4d	no	3
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6	NPL Documents	00075999.PDF	635929 4153eb2cd93d238eb4a966c0da22998d22ee5d44	no	13
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7	NPL Documents	00147251.PDF	675055 7543ec306022d53d2f6fde8776a914125c0001db	no	8

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Information:					
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Warnings:					
Information:					
			Total Files Size (in bytes):	4239239	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Applicant(s)	Wala	**AMENDMENT AND RESPONSE UNDER 37 C.F.R. § 1.114**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Group Art Unit	2618	
Examiner Name	NGUYEN, DUC M	
Confirmation No.	3898	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Final Office Action mailed on October 14, 2008 has been reviewed. Please amend the above-identified application as follows.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 24 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of claims:

1. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

2. (Original) The system of claim 1, further comprising a wireless interface device coupled to the digital host unit.

3. (Original) The system of claim 2, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

4. (Previously Presented) The system of claim 2, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

5. (Original) The system of claim 1, wherein the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals.

6. (Previously Presented) The system of claim 1, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

7. (Previously Presented) The system of claim 6, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

8. (Original) The system of claim 1, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

9. (Original) The system of claim 1, wherein the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair.

10. (Original) The system of claim 7, wherein the digital host unit further comprises an alarm/control interface circuit coupled to the multiplexer.

11. (Original) The system of claim 1, further comprising a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit.

12. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by a multimode fiber pair.

13. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by single mode fiber.

14. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

15. (Original) The system of claim 14, further comprising a wireless interface device coupled to the digital host unit.

16. (Original) The system of claim 15, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

17. (Previously Presented) The system of claim 15, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

18. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the digital host unit.

19. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the at least one digital expansion unit.

20. (Original) The system of claim 14, wherein the at least one digital expansion units are each coupled to the digital host unit via a multimode fiber pair.

21. (Original) The system of claim 14, wherein the at least one digital expansion unit is coupled to the digital host unit via a single mode fiber.

22. (Previously Presented) The system of claim 14, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

23. (Previously Presented) The system of claim 22, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

24. (Original) The system of claim 14, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

25. (Previously Presented) A method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units;

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units;

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit;

receiving the multiple digital radio frequency signals at the digital host unit;

digitally summing the multiple digital radio frequency signals together; and

converting the summed multiple digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

26. (Original) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises amplifying the analog radio frequency signals.

27. (Previously Presented) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises synchronizing a reverse path local oscillator to a master clock so as to reduce end-to-end frequency translation.

28. (Previously Presented) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units;

receiving the digitized radio frequency spectrum at the plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

29. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum comprises amplifying the radio frequency signals.

30. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum digital radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

31. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises amplifying the analog radio frequency signals.

32. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

33. (Original) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit;

receiving the digitized radio frequency spectrum at the first plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units;

receiving the digital radio frequency signals at the at least one digital expansion unit;

optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units;

receiving the second digitized radio frequency spectrum at the second plurality of digital remote units;

converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

34. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the at least two digital remote units each include:

a main radio frequency antenna;

a duplexer coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path;

a radio frequency to digital converter coupled to the duplexer in the reverse path;

a digital to radio frequency converter coupled to the duplexer in the forward path;

a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path;

an optical transmitter coupled to an output of the multiplexer chip set; and

an optical receiver coupled to an input of the multiplexer chip set;

wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

35. (Original) The system of claim 34, wherein the digital host unit includes an alarm/control interface circuit.

36. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit, wherein the digital host unit includes a channel summer to digitally sum digitized RF signals received at the digital host;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

37. (Currently Amended) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium;

an analog-to-digital unit to digitize ~~an original~~ a downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units.

38. (Previously Presented) The first unit of claim 37, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

39. (Previously Presented) The first unit of claim 37, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

40. (Previously Presented) The first unit of claim 37, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

41. (Previously Presented) The first unit of claim 37, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

42. (Previously Presented) The first unit of claim 37, further comprising:

a respective demultiplexer for each of the plurality of second units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of second units.

43. (Previously Presented) The first unit of claim 37, further comprising:

a multiplexer to produce a framed serial bit stream from the second digital samples, wherein the framed serial bit stream is communicated to the plurality of second units.

44. (Previously Presented) The first unit of claim 37, further comprising a clock recovery circuit.

45. (Currently Amended) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal produced for radiation from a respective antenna in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency produced for radiation from a respective antenna in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit; and

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency.

46. (Previously Presented) The system of claim 45, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

47. (Previously Presented) The system of claim 45, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

48. (Previously Presented) The system of claim 45, further comprising:

a respective demultiplexer for each of the plurality of other units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of other units.

49. (Previously Presented) The system of claim 45, further comprising:

a multiplexer to produce a framed serial bit stream from the other digital samples, wherein the framed serial bit stream is communicated to the plurality of other units.

50. (Previously Presented) The system of claim 45, further comprising a clock recovery circuit.

51. (Currently Amended) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing ~~an original~~ a downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples; and

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency.

52. (Currently Amended) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from ~~an original~~ a downstream analog radio frequency signal produced for radiation from an antenna;

a power distribution interface to provide power to at least one of the plurality of second units; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units.

53. (Previously Presented) The first unit of claim 52, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

54. (Previously Presented) The first unit of claim 52, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

55. (Previously Presented) The first unit of claim 52, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

56. (Previously Presented) The first unit of claim 52, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

57. (Previously Presented) The first unit of claim 52, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

58. (Currently Amended) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal produced for radiation from a respective antenna;

a power distribution interface to provide power to at least one of the plurality of other units;

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency produced for radiation from a respective antenna in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

59. (Previously Presented) The system of claim 58, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

60. (Previously Presented) The system of claim 58, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

61. (Previously Presented) The system of claim 58, wherein the interface of the host unit is operable to communicatively couple the host unit to at least one other unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one other unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one other unit.

62. (Previously Presented) The system of claim 58, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

63. (Previously Presented) The system of claim 58, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

64. (Currently Amended) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples;

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

distributing power to at least one of the second units.

65. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer; and

wherein the second reference signal is generated by frequency dividing the first reference signal.

66. (Previously Presented) The first unit of claim 65, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;
wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

67. (Previously Presented) The first unit of claim 66, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

68. (Previously Presented) The first unit of claim 65, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

69. (Previously Presented) The first unit of claim 65, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

70. (Previously Presented) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer;

wherein the second reference signal is generated by frequency dividing the first reference signal;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

71. (Previously Presented) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;

wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

72. (Previously Presented) The system of claim 71, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

73. (Previously Presented) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

74. (Previously Presented) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples;

converting the stream of summed upstream digital RF samples to an analog signal;

mixing a signal derived from the analog signal is with a first reference signal to produce a first mixed signal;

mixing a signal derived from a first mixed signal with a second reference signal; and

generating the second reference signal by frequency dividing the first reference signal.

75. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to the plurality of second units using at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the first unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of second units; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units;

wherein sample rates used by the host unit and the other units are locked together.

76. (Previously Presented) The first unit of claim 75, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

77. (Previously Presented) The first unit of claim 75, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

78. (Previously Presented) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the host unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of other units; and

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein sample rates used by the host unit and the other units are locked together.

79. (Previously Presented) The system of claim 78, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

80. (Previously Presented) The system of claim 78, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

81. (Previously Presented) A first unit comprising:

means for communicatively coupling the first unit to a plurality of second units;

means for digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

means for communicating at least a portion of the downstream digital RF samples to the plurality of second units;

means for receiving from the plurality of second units respective upstream digital RF samples;

means for digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples; and

means for converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency.

REMARKS

The Final Office Action mailed on October 14, 2008 has been reviewed. Claims 37, 51, 52, 58, and 64 have been amended. Accordingly, claims 1-81 are pending in this application.

Rejections Under 35 U.S.C. § 102

Claims 37-40, 51 and 53-55 were rejected under 35 USC § 102(b) as being anticipated by Chum (U.S. Patent No. 4,667,319).

In order to expedite prosecution, **claim 37** has been amended to recite "an analog-to-digital unit to digitize a downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples."

Even assuming for the sake of argument that an "analog voice signal" of Chum is a radio frequency signal, an "analog voice signal" is not "an analog radio frequency signal produced for radiation from an antenna" as recited in amended claim 37. The analog voice signal of Chum is produced from a sound wave (which is not a radio frequency signal) by a transducer (such as a microphone). The analog voice signal is produced in order to reproduce the sound wave from the analog voice signal using another transducer (such as a speaker). The analog voice signal is not produced for radiation from an antenna as recited in amendment claim 37.

Claims 38-40 depend from claim 37. Therefore, at least the same arguments set forth above with respect to claim 37 apply to these dependent claims. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 37, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

In order to expedite prosecution, **claim 51** has been amended to recite "digitizing a downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples." It is respectfully submitted that at

least the same arguments set forth above with respect to claim 37 apply to amended claim 51 as well.

Claims 53-55 depend from claim 51. Therefore, at least the same arguments set forth above with respect to claim 51 apply to these dependent claims. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 51, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Accordingly, Applicant requests that this rejection be withdrawn.

Rejections Under 35 U.S.C. § 103

Claims 45-46, 52, 58-62 and 64 were rejected under 35 USC § 103(a) as being unpatentable over Chum (U.S. Patent No. 4,667,319).

Claims 45-46 depend from claim 37. Therefore, at least the same arguments set forth above with respect to claim 37 apply to these dependent claims. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 37, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

In order to expedite prosecution, **claim 52** has been amended to recite "the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from a downstream analog radio frequency signal produced for radiation from an antenna". It is respectfully submitted that at least the same arguments set forth above with respect to claim 37 apply to amended claim 52 as well.

In order to expedite prosecution, **claim 58** has been amended to recite "wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal produced for radiation from a respective antenna" and "wherein each of the other units digitizes an original upstream analog radio frequency produced for radiation from a

respective antenna in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit." It is respectfully submitted that at least the same arguments set forth above with respect to claim 37 apply to amended claim 58 as well.

Claims 59-62 depend from claim 58. Therefore, at least the same arguments set forth above with respect to claim 58 apply to these dependent claims. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 58, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

In order to expedite prosecution, **claim 64** has been amended to recite "digitizing an original downstream analog radio frequency signal produced for radiation from an antenna in order to produce downstream digital RF samples." It is respectfully submitted that at least the same arguments set forth above with respect to claim 37 apply to amended claim 64 as well.

Accordingly, Applicant requests that this rejection be withdrawn.

Claims 1-3, 5-16, 18-32, 34-64 and 75-81 were rejected under 35 USC § 103(a) as being unpatentable by Russell et al. (U.S. Patent No. 5,644,622) in view of Graves (U.S. Patent No. 6,198,558).

In response to Applicant's previous argument regarding Graves merely describing a passive optical splitter/combiner, the Office Action stated the following:

> In response, the Examiner asserts that the combiner of the passive optical splitter/combiner would "adds the optical energy on each fiber and sends the resultant signal along an umbilical link 4a to the HDT" as recited in the above paragraph. Here, digital adding would be the same as digital summing, noting that HDT is a host digital terminal.

In other words, the Office Action reasons that since Graves teaches a passive optical splitter/combiner that "adds" optical signals over which digital data may be

communicated, it is teaching "digitally adding" which is the same as "digitally summing." Applicant respectfully traverses this reasoning. Graves does not teach "digital adding" or "digital summing". Graves clearly teaches a ***passive*** optical splitter/combiner. That digital data may be communicated over the optical signals that are being passively combined does not change the fact that the ***act of combining*** performed by the ***passive*** optical splitter/combiner is not digital.

It is respectfully submitted that at least these arguments apply to **claims 1-3, 5-16, 18-27, 34-64 and 75-81**. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Claim 28 recites in part "converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum" and "optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units."

Russell fails to teach of suggest the use of a "shared analog-to-digital converter" as recited in claim 28. The Office Action makes reference to the embodiment shown in FIG. 12 of Russell. However, neither FIG. 12 nor FIG. 13 of Russell teach the use of a "shared analog-to-digital converter". To the extent that FIG. 13 of Russell teaches anything in this regard, FIG. 13 teaches combining/splitting in the analog RF domain. To the extent that multiple remote antenna units 102 are fed from the same base station, a separate digital/optical transceiver unit 130 is provided for each remote antenna unit 102, with splitting/combining occurring in the analog RF domain.

Claims 29-32 depend from claim 28. Therefore, at least the same arguments set forth above with respect to claim 28 apply to these dependent claims. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 28, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Accordingly, Applicant requests that this rejection be withdrawn.

Claims 4 and 17 were rejected under 35 USC § 103(a) as being unpatentable by Russell et al. (U.S. Patent No. 5,644,622) in view of Graves (U.S. Patent No. 6,198,558) further in view of Kallander et al. (U.S. Patent No. 5,603,080).

Claim 4 depends from claim 1. Therefore, at least the same arguments set forth above with respect to claim 1 apply to claim 4. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to claim 4 have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to claim 4 if a further response is required.

Claim 17 depends from claim 14. Therefore, at least the same arguments set forth above with respect to claim 14 apply to claim 17. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 14, specific arguments with respect to claim 17 have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to claim 17 if a further response is required.

Accordingly, Applicant requests that this rejection be withdrawn.

Claim 33 was rejected under 35 USC § 103(a) as being unpatentable by Russell et al. (U.S. Patent No. 5,644,622) in view of Graves (U.S. Patent No. 6,198,558) further in view of Dail (U.S. Patent No. 5,765,097).

Claim 33 recites in part "optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit".

The Office Action conceded that neither Russell nor Graves teach or suggest this. However, the Office Action went on to state the following:

> However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by Dail (see Fig. 2, ref. 220 and col. 4, line 28 - col. 5, line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Dail's teaching to Russell, for providing a further digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Dail relates to a system in which multiple regenerative repeaters are used. Each regenerative repeater fully demodulates the inbound signal in order to recover the originally transmitted data. The originally transmitted signal is then re-transmitted. Thus, each repeater must have the ability to demodulate and modulate in accordance with the protocol that was originally used to transmit the data. This is how Dail reduces "the amount of aggregated ingressive noise." In other words, the Dail system is modulation dependent. In contrast, the Russell system teaches a modulation independent RF distribution scheme in which a portion of RF spectrum is digitized and then optically transmitted from a first unit to a second unit, where the original RF spectrum is re-created in a digital-to-analog operation. It is respectfully submitted that one of ordinary skill in the art would have picked one or the other scheme but would not have made the combination proposed in the application.

Accordingly, Applicant requests that this rejection be withdrawn.

Allowable Subject Matter

Applicant thanks the Examiner for the indication that claims 65-74 are allowed.

CONCLUSION

Applicant respectfully submits that claims **1-81** are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

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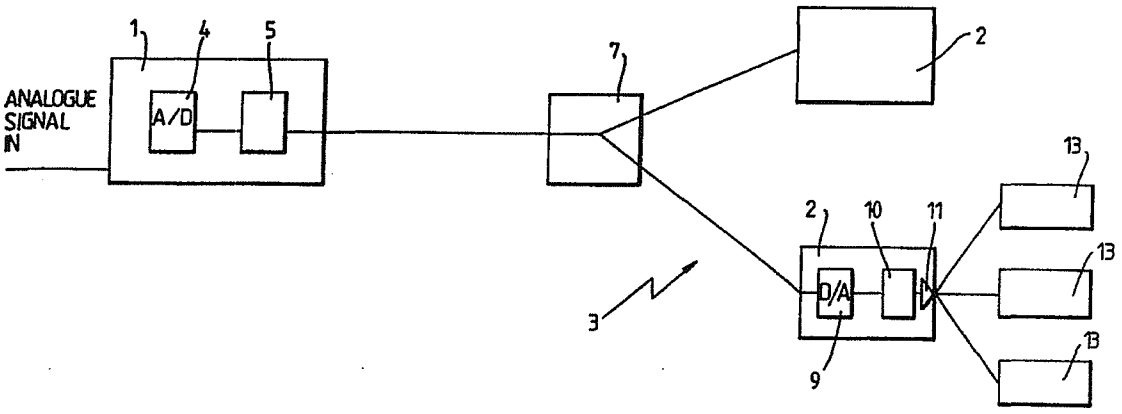
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(54) Title: SIGNAL DISTRIBUTION



(57) Abstract

Signals, such as television signals, are distributed from a head-end station (1) via a fibre network (3). The signals are amplitude modulated on carriers at different frequencies, and the different carriers combined to form a composite analogue signal. In the head-end station (1) the composite analogue signal is clipped to reduce the peak-to-mean ratio and the clipped composite signal is digitised. The resulting digital data is transmitted onto the fibre network and is received at an optical receiver (2). The optical receiver (2) reconstitutes the composite analogue signal for reception by a termination. In one example the composite analogue signal has a bandwidth of one octave or less, and is digitised by sampling at a sampling rate below the Nyquist rate.

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SIGNAL DISTRIBUTION

The present invention relates to the distribution of signals on a network and in particular to the distribution of AM (amplitude modulated) television signals.

Conventionally, television has been broadcast as AM signals with different channels modulated onto sub-carriers at different frequencies. Existing cable television services using copper coaxial cable have adopted corresponding analogue AM techniques to provide channels in a region of the same UHF spectrum used for broadcast television.

It is now proposed to use cable networks such as fibre optic networks for the distribution of television signals. The wide bandwidth offered by such networks offers the possibility of upgrading to carry future wideband services such as HDTV and the same network may also be used for services other than television, such as telephony. However whilst the use of AM techniques is necessary if the television signals are to be received by conventionally equipped television sets there are a number of problems associated with the use economically of AM techniques on optical networks. In particular the carrying of AM optical signals requires less splitting in order to allow a high power budget, and the use of highly specified linear opto-electronic devices.

According to the present invention, a method of distributing signals from a head-end station via an network comprises combining a plurality of AM channels modulated on sub-carriers at different frequencies to form a composite analogue signal, treating the composite analogue signal to reduce the peak-to-mean ratio, digitising the composite analogue signal, transmitting resulting digital data onto the network, receiving the

digital data at a receiver and reconstituting the composite analogue signal for reception at a termination.

Preferably the network is an optical network and the receiver is an optical receiver. Preferably the composite analogue signal is treated by clipping the signal.

A preferred aspect of the present invention provides a method of distributing, e.g., television signals which is particularly well-adapted to use with optical networks whilst at the same time maintaining compatibility with conventional analogue television sets. As noted above, television signals used for terrestrial broadcasting are modulated onto sub-carriers at different frequencies. When a composite signal is formed by adding together the different channels the resulting waveform has a much higher peak-to-mean ratio than the individual carriers. It is therefore possible to clip or compress the maxima and minima before quantising without significantly degrading the performance. The A/D converter used for digitising the signal can then operate over a more restricted input amplitude range and so requires fewer quantisation levels to achieve an adequate output video signal-to-noise ratio.

Preferably the method includes receiving the digitised signal at a node remote from the termination and transmitting the reconstituted signal onwards for reception at the termination.

The detection of the digital data is advantageously carried out at a node such as a distribution box or pedestal near the customer's premises. The television signals may then be delivered over conventional coaxial cable in a standard format, avoiding the need for a special adapter or other equipment at the customer-end.

Preferably the composite analogue signal has a bandwidth of one octave or less and is digitised by sampling at a sampling rate below the Nyquist rate.

Preferably, in addition to or as an alternative to clipping the composite analogue signal the method further comprises compressing the composite analogue signal at the head-end station and applying complementary expansion at the receiver.

Companding may be carried out either in the analogue or in the digital domain and preferably the compression function is the cumulative distribution function of the Gaussian probability distribution function.

According to a further aspect of the present invention there is provided a system for distributing signals comprising a head-end station, one or more receivers, and a network connecting the head-end station to the or each receiver, the head-end station including an input stage arranged to receive a composite analogue signal comprising a plurality of AM channels modulated on sub-carriers at different frequencies, converter means arranged to treat the composite analogue signal to reduce the peak-to-mean ratio and to digitise the composite analogue signal, and transmitter means arranged to transmit the resulting digital data onto the network, the receiver including reconstituting means arranged to reconstitute the composite analogue signal and output means arranged to output the composite analogue signal for reception by a termination.

A method and system in accordance with the present invention will now be described in further detail with reference to the accompanying drawings, in which:

Figure 1 is a block diagram showing a distribution system;

Figure 2 is a block diagram showing a signal path in greater detail;

Figure 3 is a diagram showing an alternative arrangement for the multiplexer of Figure 2; and

Figures 4a - 4d are diagrams showing sub-carriers and a composite signal.

A system for distributing television signals via an optical fibre network comprises a head-end station 1 and a number of optical receivers 2 connected to the head-end station 1 via a fibre network 3. In the present example the fibre network 3 is a passive optical network using a star topology but the present invention is equally applicable to other fibre optic networks using different topologies.

The head-end station 1 receives at its input a composite analogue signal which in the present example covers the spectrum from 470-860 MHz. This input signal comprises sub-carriers at different frequencies amplitude-modulated with different television signals. These signals are input to an A/D converter 4 which, as described in further detail below, clips and digitises the signal. An optical transmitter 5 modulates an optical signal with the digital data output by the A/D converter and outputs the signal onto the fibre network 3. The signal passes through different stages of the fibre network 3, including one or more passive optical splitters 7 and is received by the optical receivers 2. For clarity only two optical receivers 2 are shown in Figure 1, but in practice many more may be connected to each network. At the receivers 2 which may, for example, be positioned in street cabinets, the composite optical signal is reconstituted from the optical data and output as an analogue signal via coaxial cables 8 to conventional television sets 13.

The signal path from the head-end station 1 to the television set is shown in greater detail in Figure 2. Data is output from the A/D converter 4 in parallel as

8-bit words. An 8:1 multiplexer 8 converts the output from the A/D converter 4 to a serial bit stream. This bit stream is used to modulate the output from the optical transmitter 5 using conventional techniques. The operation of the multiplexer 8 is locked to a 7 GHz clock generated locally in the head-end station. This clock signal is divided by eight to provide a lower rate clock for the A/D converter 4. In transmission over the fibre network 3 the signal output by the transmitter 5 may be split up to 49 ways, within the constraints of the power budget in the present example. At the receiver 2 a 1:8 demultiplexer 12 assembles 8-bit parallel words from the serial datastream and outputs those 8-bit words to a D/A converter 9. The output from the D/A converter 9 passes through a band pass filter 10 and via an output amplifier stage 11 to up to 20 different television sets 13 connected to the receiver 2 by conventional coaxial cables.

The system may be used to distribute signals to so-called "cable ready" sets. Such sets typically have a VHF baseband input up to 450 MHz. For such systems use can be made of aliasing channels present in the lower frequency range. These are channels at frequencies below those of the original components of the composite analogue signal which are generated as a result of sampling below the Nyquist rate. In this case the reconstituting filter 10 is a low-pass filter rather than a band-pass filter. The low frequency channels output from the reconstituting filter are inverted unless the input to the A/D converter is first inverted.

Figures 4a - 4d, show schematically the formation of the composite analogue signal from three carriers c_1, c_2, c_3. The carriers have amplitudes p_1, p_2, p_3 respectively. The mean (rms) level of each carrier is then $p_n/(2\ 2)$. The different component carriers add

together to form the composite signal shown in Figure 4d. It can be shown that the amplitude of the composite signal, when it comprises n channels, each of amplitude p is np and its mean level is n(p/2 2). The peak-to-mean ratio of the composite signal is therefore far greater than that of the individual sub-carriers. At the input to the A/D converter relatively severe clipping may be applied to limit the dynamic range of the signal prior to quantisation making it possible to minimise the number of quantisation levels without significant loss in the quality of the signal. Clipping may be applied using an appropriate clipping stage before the A/D converter. Alternatively if that converter has suitable clipping characteristics clipping may be achieved by overloading it by a suitable margin.

The composite analogue signal is limited in bandwidth to less than one octave. Not only does this serve to reduce second order intermodulation distortion but it makes possible sampling at a rate below the Nyquist minimum, that is twice the frequency of the maximum frequency component of the signal. Sampling below the Nyquist rate causes aliasing distortion. When however the signal is confined to less than one octave and sampled at a rate only slightly greater than the maximum frequency component the aliasing distortion falls in the unused frequency band below the signal octave band. The aliasing distortion therefore does not compromise the performance of the system and the bit rate of the system is only one half that needed for full Nyquist sampling. As noted above, when generating signals for cable-ready VHF TV sets the production of low frequency aliasing channels may be used to shift the received channels into the desired frequency range.

The A/D converter 4 defines a number of amplitude bands and determines which amplitude band matches the

sample value. Each amplitude band is represented by a binary word and a byte is output accordingly. The resultant bit rate when these bytes are converted to a serial stream by the 8:1 multiplexer 8, is the product of the sampling rate and the number of digits in a byte. Clipping minimises the number of quantisation levels required and so enables a reduction in the byte size and bit rate.

Optionally compression may be applied to the signal before or after it is sampled by the A/D converter 4. Known A/D converters for video signals use linear quantising with one output byte representing one quantisation level. The present system however by applying compression to the composite analogue signal as it is digitised reduces the number of possible output words required for a given output video quality by a factor of two or more, giving a further saving in the bit rate. The preferred compression function is the cumulative distribution function of the Gaussian probability distribution function (PDF). If the input waveform to the compressor has a Gaussian PDF, the output PDF from the compressor is uniform with output in the range 0 to 1. This uniform PDF can then be quantised linearly and each output codeword is then equi-probable. The compressor and matching expander at the receiver may be realised in hardware using a network of diodes and resistors, or in software using a look-up table following a suitable linear A/D converter.

The digital circuits in the head-end station 1 and the receiver 2 are synchronised using word alignment techniques. For example, the least significant bit in each word may be identified by a periodic function such as a Barker code by regular bit stealing. This sequence is then detected using a suitable sampler, logic function

and clock slip circuit. Preferably the clock operates at the word rate rather than the serialised bit rate.

In an alternative arrangement shown in Figure 3 two 8:1 multiplexers are used in parallel at a lower clock rate of 1.2 GHz. In this case a pair of A/D converters are used, operating at a clock rate one eighth of that of the multiplexers.

Although the embodiment discussed above relates to the distribution of television signals, the invention, in its broadest aspects, is applicable to other signals such as, e.g., audio signals.

CLAIMS

1. A method of distributing signals from a head-end station via a network comprising combining a plurality of AM channels modulated on sub-carriers at different frequencies to form a composite analogue signal, treating the composite analogue signal to reduce the peak-to-mean ratio, digitising the composite analogue signal, transmitting resulting digital data onto the network, receiving the digital data at a receiver and reconstituting the composite analogue signal for reception at a termination.

2. A method according to claim 1, in which the network is an optical network, the receiver is an optical receiver, and the composite analogue signal is treated by clipping the signal.

3. A method according to claim 1 or 2, including receiving the digitised signal at a node remote from the termination, and transmitting the reconstituted signal onwards for reception at the termination.

4. A method according to claim 2 or 3, in which the composite analogue signal has a bandwidth of one octave or less and is digitised by sampling at a sampling rate below the Nyquist rate.

5. A method according to any one of claims 1 to 4, including compressing the composite analogue signal at the head-end station and applying complementary expansion to the signal at the receiver.

6. A system for distributing signals comprising a head-end station, one or more receivers, and a network connecting the head-end station to the or each receiver, the head-end station including an input stage arranged to receive a composite analogue signal comprising a plurality of AM channels modulated on sub-carriers at different frequencies, converter means arranged to treat

the composite analogue signal to reduce the peak-to-mean ratio and to digitise the composite analogue signal, and transmitter means arranged to transmit the resulting digital data onto the network, the receiver including reconstituting means arranged to reconstitute the composite analogue signal and output means arranged to output the composite analogue signal for reception by a termination.

7. A system according to claim 6, in which the network is an optical network, the receiver is an optical receiver, and the converter means are arranged to clip the composite analogue signal.

8. A system according to claim 7, in which the or each optical receiver is located at a respective node remote from the termination and is arranged to transmit the reconstituted signal onwards for reception at the termination.

9. A system according to claim 7 or 8, in which the composite analogue signal has a bandwidth of one octave or less and the converter means are arranged to sample the composite analogue signal at a sampling rate below the Nyquist rate.

10. A system according to any one of claims 6 to 9, further including compression means located in the head-end station and expansion means located in the or each receiver and arranged to apply complementary compression and expansion to the composite analogue signals.

9. A method of distributing signals substantially as described with respect to the accompanying drawings.

10. A system for distributing signals substantially as described with respect to the accompanying drawings.

11. A method or system according to any one of the preceding claims, in which the signals distributed from the head-end station are television signals.

SUBSTITUTE SHEET

Fig.1.

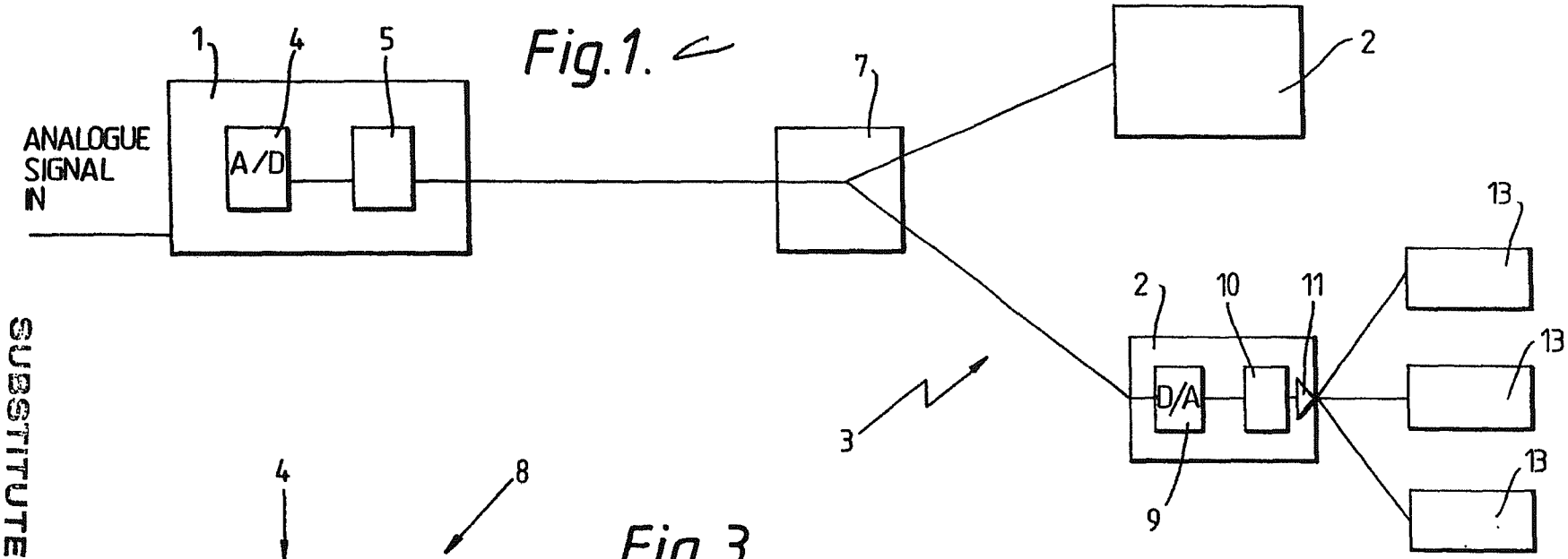
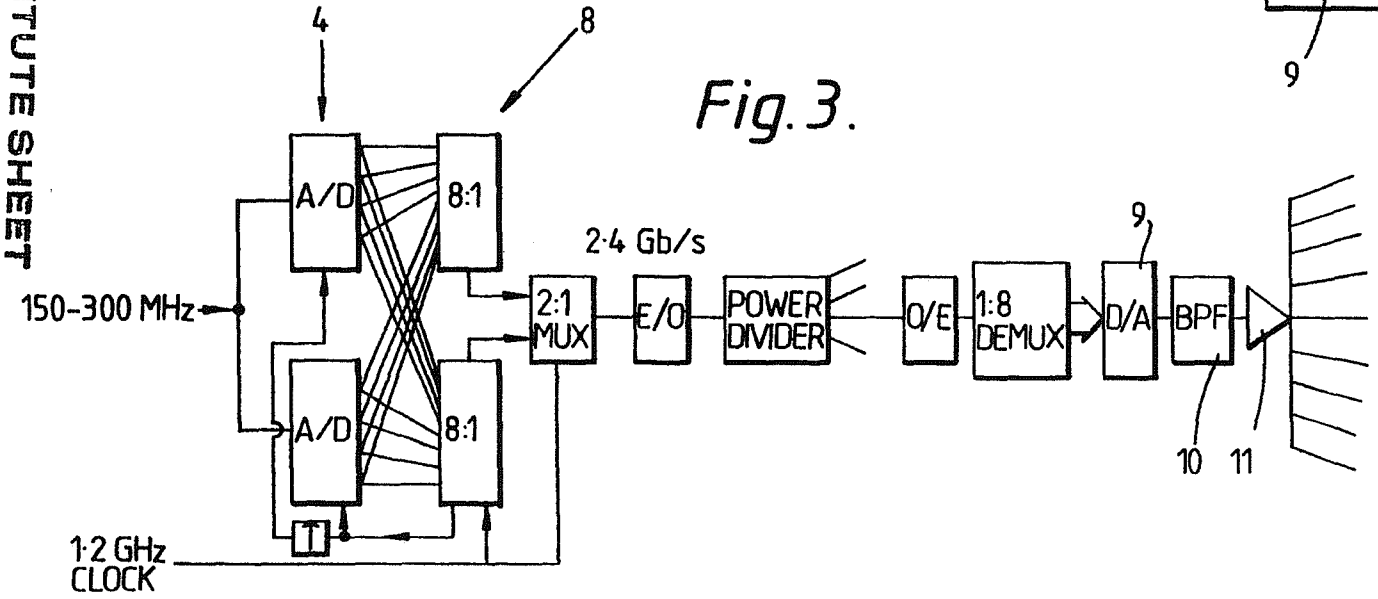


Fig.3.



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Page 199

Fig. 2.

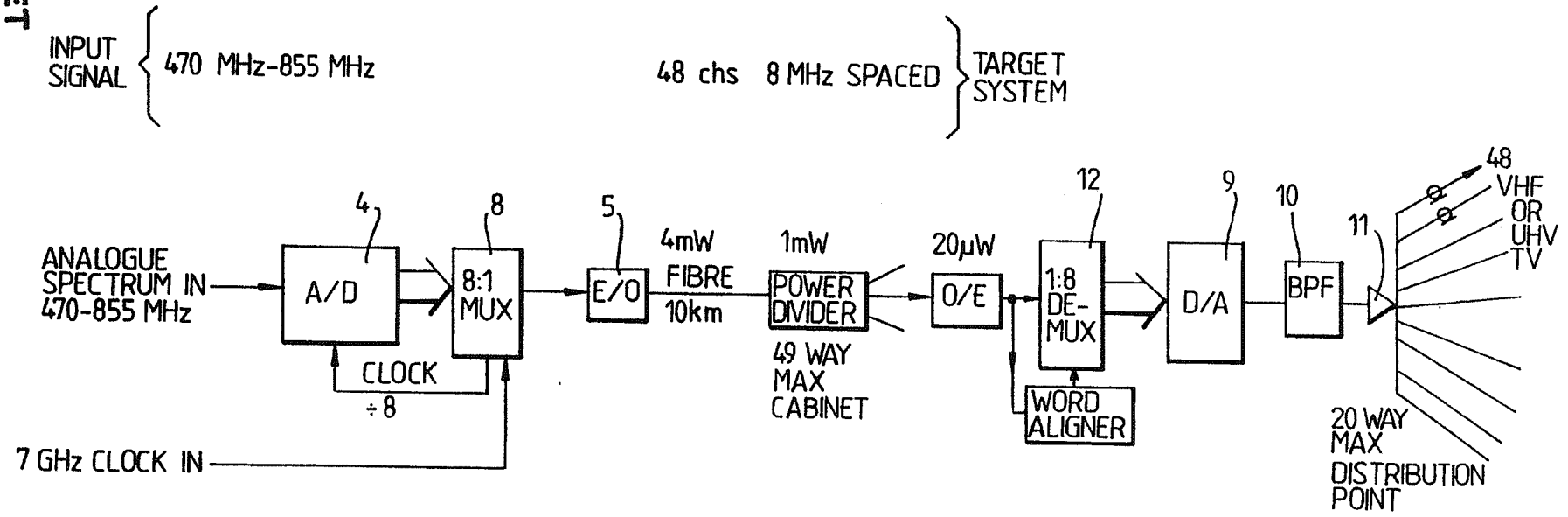
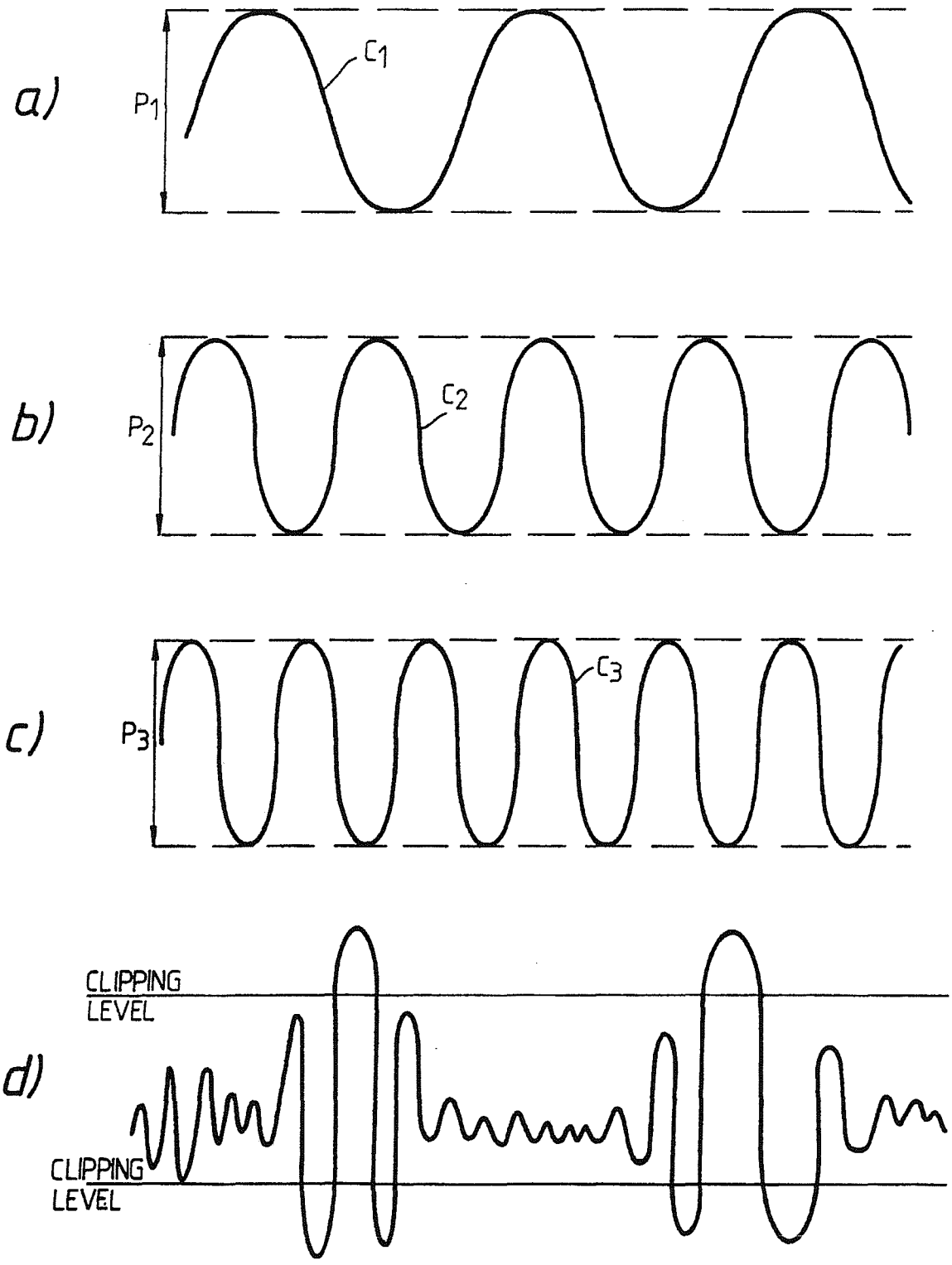

INPUT SIGNAL
470 MHz-855 MHz
48 chs 8 MHz SPACED
TARGET SYSTEM
ANALOGUE SPECTRUM IN 470-855 MHz
A/D
4
8:1 MUX
8
CLOCK ÷8
7 GHz CLOCK IN
E/O
5
4mW
FIBRE 10km
1mW
POWER DIVIDER
49 WAY MAX CABINET
20µW
O/E
1:8 DE-MUX
12
WORD ALIGNER
D/A
9
BPF
10
11
48 VHF OR UHV TV
20 WAY MAX DISTRIBUTION POINT

Fig.4.



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Page 201

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 91/00568

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: H 04 N 7/22

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	H 04 N

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	Symposium Record, CATV sessions 16th International TV Symposium, Montreux, 17-22 June 1989, H.H. Tan et al.: "CATV distribution over a fibre optic local network", pages 262-272 see abstract; page 266, lines 1-10 ---	1,2,6-8,11
A	Funkschau, volume 62, no. 1, 29 December 1989/90, (Munich, DE), M.Gendisor et al.: "Signale auf der Glasfaser", pages 51-55 see page 54, right-hand column, line 46 - page 55, left-hand column, line 5 ---	1-3,6-8, 9-11
A	Conférence Européenne sur les Communications Optiques, Cannes, 21-24 September 1982, E. Roza et al.: "TV system with remote selection for subscriber glass fiber networks", pages 497-500 see page 499, left-hand column, lines 17-37; figure 1 ---	1-3,6-8, 9-11

./.

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
19th June 1991	24 JUN 1991
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	MISS T. TAZELAAR

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	Electronics Letters, volume 24, no. 7, 31 March 1988, (Stevenage, Herts, GB), F.V.C. Mendis et al.: "20 Km single-mode optical fibre system for multichannel video", pages 442-443 see page 442, left-hand column, lines 16-28 ---	1-4,6-11
A	Patent Abstracts of Japan, volume 10, no. 363 (E-461)(2420), 5 December 1986, & JP, A, 61158281 (MATSUSHITA ELECTRIC IND. CO. LTD.) 17 July 1986	1-11

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

34206 7590 10/14/2008

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NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

NOTIFICATION DATE	DELIVERY MODE
10/14/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@fogglaw.com

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	DUC M. NGUYEN	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-81* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *65-74* is/are allowed.

6)☒ Claim(s) *1-64 and 75-81* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to applicant's response filed on 7/1/08. Claims 1-81 are now pending in the present application. **This action is made final**.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims **37-40, 51, 53-55** are rejected under 35 U.S.C. 102(b) as being anticipated by **Chum** (US Patent Number **4,667,319**).

Regarding claim **37, Chum** discloses a first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium (see Fig. 2, wherein the "branching circuit 9" would read on the "first unit", the "T/R 10 and T/R 12" would read on the "second units");

an analog-to-digital unit to digitize an original downstream analog radio frequency signal (39) in order to produce downstream digital RF samples 23, 31 (see Fig. 2, ref. ADC 42 and col. 3, lines 15-56); and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples (21, 33) to a replicated upstream analog radio frequency 41 (see Fig. 2, ref. DAC 44 and col. 3, lines 15-56); and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples (21, 33) received from the plurality of second units (see Fig. 2, ref. 55 and col. 3, lines 15-56); and

wherein the first unit communicates at least a portion of the downstream digital RF samples (23, 31) to the plurality of second units (see Fig. 2 and col. 3, lines 15-56).

Therefore, the claimed limitations are anticipated by Chum, noting that the analog voice signals at voice frequency in Chum would read on the claimed analog radio frequency (RF) signals.

Regarding claim **38, Chum** would teach the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable as claimed (see col. 2, lines 26-30).

Regarding claim **39, Chum** would teach the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit as claimed (see Fig. 2, regarding adders 50, 52, 55 and col. 2, lines 26-30).

Regarding claim **40,** with the broadest reasonable interpretation, the “branching unit” would read on the claimed “digital host unit” or “digital expansion unit”.

Regarding claims **51, 53-55**, the claims are rejected for the same reason as set forth in claims **37-39** above.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims **45-46, 52, 58-62, 64** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Chum.**

Regarding claim **45,** the claim is rejected for the same reason as set forth in claim **40** above regarding the "host unit", wherein it would have been obvious that the system in Chum would be capable of distributing signals to a plurality of subscribers.

Regarding claim **46,** with the broadest reasonable interpretation, the "branching unit" would read on the claimed "digital host unit" or "digital expansion unit".

Regarding claim **52,** the claim is rejected for the same reason as set forth in claim **51** above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Chum**, for providing a power distribution interface as claimed, as an obvious design choice in order to supply power to the T/R units for operation purpose.

Regarding claim **58,** the claim is rejected for the same reason as set forth in claims **45, 52** above.

Regarding claim **59,** the claim is rejected for the same reason as set forth in claim **58** above. In addition, Chum would teach an ADC as claimed (see Fig. 2, ref. 42).

Regarding claim **60, Chum** would teach the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable as claimed (see col. 2, lines 26-30).

Regarding claim **61, Chum** would teach the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit as claimed (see Fig. 2, regarding adders 50, 52, 55 and col. 2, lines 26-30).

Regarding claim **62,** with the broadest reasonable interpretation, the "branching unit" would read on the claimed "digital host unit" or "digital expansion unit".

Regarding claim **64,** the claim is rejected for the same reason as set forth in claim **52** above regarding the power distribution limitation.

5. Claims **1-3, 5-16, 18-32, 34-64, 75-81** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** et al (US **5,644,622**) in view of **Graves** (US **6,198,558**).

Regarding claim **1, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Figs. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 would be shared by digital remote units 102.

However, **Russell** is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it would have been obvious that the downstream signal would be splitted in the forward path (i.e, downstream direction), and in the reverse path (or upstream direction) from a DRT 102 to the digital host unit 106, upstream signals from these two DRTs 102 (see Fig. 12) would obviously be combined/summed by an optical combiner 946 as shown in Fig. 44, wherein it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the optical combiner 946, the WDM 930 (see Fig. 44) as an integral part of the digital base station 106 (see Figs. 12, 14 regarding WDM 270 as a digital expansion unit of the base station 106) since it has been held that forming in one piece an article which has formally been formed in two pieces and put together involves only routine skill in the art. Howard v. Detroit Stove Works, 150 U.S. 164 (1893).

However, **Russell** fails to explicitly teach that the optical combiner 946 would digitally summing digitized RF signals from the DRTs. However, in an analogous art, **Graves** teaches an optical splitter/combiner that **clearly adds** digitized RF signals in the upstream direction (see Figs. 1B, 2B, 3B regarding ref. 30 and col. 5, lines 23-27, **col. 9, lines 15-22**). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell**, for digitally summing/adding digitized RF signals from two DRTs before converting to an analog signal, for reducing the amount of aggregated ingressive noise caused by A/D converters and/or for cost saving (i.e, only one D/A converter is required for converting these two digital signals).

Regarding claim **2, Russell** would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim **3, Russell** would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim **5, Russell** would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim **6, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized

radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **7,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would obviously teach the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed as disclosed by **Graves** (see Figs. 1B, 2B, 3B regarding ref. 30 and col. 9, lines 15-22).

Regarding claim **8, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **9, Russell** would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim **10, Russell** would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim **11, Russell** would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-

directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the “digital expansion unit” as claimed (see col. 15, lines 25-36).

Regarding claim **12, Russell** would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim **14,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above.

Regarding claim **15,** the claim is interpreted and rejected for the same reason as set forth in claim **2** above.

Regarding claim **16,** the claim is interpreted and rejected for the same reason as set forth in claim **3** above.

Regarding claim **18, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim **19, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim **20,** the claim is interpreted and rejected for the same reason as set forth in claim **12** above.

Regarding claim **22, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized

radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **23,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim **24, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **28,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting the radio frequency signals to a digitized radio frequency spectrum (see Fig. 4 regarding broadband digitizer 132);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see Fig. 8 regarding D/A 164); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim **30,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the radio frequency signal to a digitized radio frequency sprectrum comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim **34,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **35,** the claim is interpreted and rejected for the same reason as set forth in claim **10** above regarding the “alarm/control interface”.

Regarding claim **36,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above regarding the “digital expansion unit”.

Regarding claim **13,** although **Russell** would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also

suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim **21,** the claim is interpreted and rejected for the same reason as set forth in claim **13** above.

Regarding claim **25,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the "wireless interface device").

Regarding claim **26,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim **27,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **29, 31,** the claims are rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been

obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier during A/D and/or D/A conversions as claimed, for further improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim **32,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **37-64, 81**, the claims are interpreted and rejected for the same reason as set forth in claims **1-3, 5-16, 18-32, 34-36** above, wherein the DHT or base station would read on the claimed “first unit”, the DRT would read on the claimed “second units”.

Regarding claims **75-80**, the claims are interpreted and rejected for the same reason as set forth in claims **1-3, 5-16, 18-32, 34-36** above, wherein **Russell** would obvious teach sample rates used by the host unit and remote units are locked together, in order to achieve synchronization as mentioned by **Russell** (see col. 12, lines 7-28).

6. Claims **4, 17,** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Graves** and further in view of **Kallander et al** (US Patent Number **5,603,080**).

Regarding claim **4,** it is rejected for the same reason as set forth in claim **2** above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, **Russell** fails to disclose a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that **Russell** also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed by **Kallander** (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by **Kallander** (see col. 4, lines 54-67) to compensate for propagation loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim **17,** the claim is interpreted and rejected for the same reason as set forth in claim **4** above.

7. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Graves** and further in view of **Dail** (US Patent Number **5,765,097**).

Regarding claim **33,** the claim is interpreted and rejected for the same reason as set forth in claim **28** above. However, Russell fails to disclose a further digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by **Dail** (see Fig. 2, ref. 220 and col. 4, line 28 – col. 5, line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Dail's teaching to Russell, for providing a further digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Allowable Subject Matter

8. Claims **65-74** are allowed.

Response to Arguments

9. Applicant's arguments filed 7/1/08 have been fully considered but they are not persuasive.

In the response filed 7/1/08, Applicant contends that

The Office Action took the position that the adder 55 shown in FIG. 2 of Chum is producing "summed upstream digital RF samples" as recited in claim 37 of the present application. However, Chum very clearly indicates that the adder 55 is not operating on radio frequency samples. Instead, Chum relates to a technique in which the T/R 10 and T/R 12 demodulates and demultiplexes signals communicated on the transmission path 8 to extract a

(baseband) service channel. See, e.g., Chum, column 3, lines 28-35. The adder 55 to which the Office Action refers combines data from a single, demodulated, demultiplexed basedband service channel.

The Office Action, in this regard, asserted that "the analog voice signals at voice frequency in Chum would read on the claimed analog radio frequency (RF) signals." Applicant respectfully traverses this statement. Voice signals are simply not analog radio frequency signals, and the Office Action is devoid of any explanation as to why this is case. Thus, Chum does not teach all of the features recited in claim 37.

In response, the following are excerpts from the Wikipedia website regarding

Radio frequency and audio frequency,

Radio frequency

From Wikipedia, the free encyclopedia

Jump to: navigation, search

Radio frequency (**RF**) is a frequency or rate of oscillation within the range of about 3 Hz to 300 GHz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves. Since most of this range is beyond the vibration rate that most mechanical systems can respond to, RF usually refers to oscillations in electrical circuits or electromagnetic radiation.

Contents

[hide]

- 1 Special properties of RF electrical signals
- 2 Frequencies
- 3 See also
- 4 External links

[edit] Special properties of RF electrical signals

Electrical currents that oscillate at RF have special properties not shared by direct current signals. One such property is the ease with which it can ionize air to create a conductive path through air. This property is exploited by 'high frequency' units used in electric arc welding. Another special property is an electromagnetic force that drives the

RF current to the surface of conductors, known as the skin effect. Another property is the ability to appear to flow through paths that contain insulating material, like the dielectric insulator of a capacitor. The degree of effect of these properties depends on the frequency of the signals.

[edit] Frequencies

Name	Symbol	Frequency	Wavelength	Applications
Extremely low frequency	ELF	3 to 30 Hz	10,000 km to 100,000 km	directly audible when converted to sound, communication with submarines
Super low frequency	SLF	30 to 300 Hz	1,000 km to 10,000 km	directly audible when converted to sound, AC power grids (50 hertz and 60 hertz)
Ultra low frequency	ULF	300 to 3000 Hz	100 km to 1,000 km	directly audible when converted to sound, communication with mines
Very low frequency	VLF	3 to 30 kHz	10 km to 100 km	directly audible when converted to sound (below ca. 18-20 kHz; or "ultrasound" 20-30+ kHz)
Low frequency	LF	30 to 300 kHz	1 km to 10 km	AM broadcasting, navigational beacons, lowFER
Medium frequency	MF	300 to 3000 kHz	100 m to 1 km	navigational beacons, AM broadcasting, maritime and aviation communication
High frequency	HF	3 to 30 MHz	10 m to 100 m	shortwave, amateur radio, citizens' band radio
Very high frequency	VHF	30 to 300 MHz	1 m to 10 m	FM broadcasting, broadcast television, aviation, GPR
Ultra high frequency	UHF	300 to 3000 MHz	10 cm to 100 cm	broadcast television, mobile telephones, cordless telephones, wireless networking, remote keyless entry for automobiles, microwave ovens, GPR
Super high frequency	SHF	3 to 30 GHz	1 cm to 10 cm	wireless networking, satellite links, microwave links, Satellite television, door openers.
Extremely high	EHF	30 to 300 GHz	1 mm to 10 mm	microwave data links, radio astronomy, remote sensing,

frequency	advanced weapons systems, advanced security scanning

[edit] See also

- Radio waves
- Frequency allocation
- Plastic Sealing/Welding Technologies
- Ultrasound
- RF connector

[edit] External links

- Definition of frequency bands (VLF, ELF … etc.) IK1QFK Home Page (vlf.it)
- Radio, light, and sound waves, conversion between wavelength and frequency
- RF eBooks - Some free RF related eBooks
- RF and Telecommunication eBooks
- RF Terms Glossary

v • d • e

ELF	SLF	ULF	VLF	L
3 Hz	30 Hz	300 Hz	3 kHz	30
30 Hz	300 Hz	3 kHz	30 kHz	300

[show]

v • d • e

Electromagnetic spectrum



Retrieved from "http://en.wikipedia.org/wiki/Radio_frequency"
Categories: Radio spectrum • Radio technology • Waves • Electromagnetic spectrum

Audio frequency

From Wikipedia, the free encyclopedia

Jump to: navigation, search

An **audio frequency** (abbreviation: **AF**), or **audible frequency** is characterized as a periodic vibration whose frequency is audible to the average human. While the range of frequencies that any individual can hear is largely related to environmental factors, the generally accepted standard range of audible frequencies is 20 to 20,000 hertz. Frequencies below 20 Hz can usually be felt rather than heard, assuming the amplitude of the vibration is high enough. Frequencies above 20,000 Hz can sometimes be sensed by young people, but high frequencies are the first to be affected by hearing loss due to age and/or prolonged exposure to very loud noises.

[edit] Frequencies and descriptions

Frequency (Hz)	Octave	Description
16 to 32	1st	The human threshold of feeling, and the lowest pedal notes of a pipe organ.
32 to 512	2nd to 5th	Rhythm frequencies, where the lower and upper bass notes lie.
512 to 2048	6th to 7th	Defines human speech intelligibility, gives a horn-like or tinny quality to sound.

2048 to 8192	8th to 9th	Gives presence to speech, where labial and fricative sounds lie.
8192 to 16384	10th	Brilliance, the sounds of bells and the ringing of cymbals. In speech, the sound of the letter "S" (8000-11000 Hz)

Therefore, according to Wikipedia, since the voice signals would have a frequency between 3 Hz to 300 GHz, the voice signal would be a RF signal. Since Chum teaches analog-to-digital converters (ADC), it is clear that the voice signal for inputting to the ADC would be an analog signal. Therefore, the voice signal would read on the claimed analog RF signal.

The same argument regarding the “analog RF signal” as set forth above would apply equally well to claims 38-40, 45-46, 52, 58-62, 64 since no further arguments are provided by Applicant.

Applicant further contend s that

Claims 1-3, 5-16, 18-32, 34-64, 75-81 were rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Graves (U.S. Patent No. 6,198,558).

Claim recites, in part, "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit."

The Office Action conceded that Russell fails to teach this. The Office Action then went on to assert that:

However, Russell fails to explicitly teach that the optical combiner 946 would digitally summing digitized RF signals from the DRTs. However, in an analogous art, Graves teaches an optical splitter/combiner that clearly adds digitized RF signals in the upstream direction (see Figs. 1 B, 2B, 3B regarding ref. 30 and col. 5, lines 23-27, col. 9, lines 15-22). Therefore, it would have been obvious to one of ordinary skill in the

art at the time the invention was made to modify Russell, for digitally summing/adding digitized RF signals from two DRTs before converting to an analog signal, for reducing the amount of aggregated ingressive noise caused by A/D converters and/or for cost saving (i.e, only one D/A converter is required for converting these two digital signals).

The portions of Graves cited in the Office Action in this regard are as follows: "A number of different ONUs in the same vicinity are grouped together by virtue of their associated distribution cables being joined together at a passive optical splitter 30 which is connected directly by means of an optical fiber umbilical 4a to a transceiver 16 of the HDT 1 ." Column 5, lines 23-27 and "Multiple optical fibers come together at a passive optical splitter 30, which in the upstream direction **adds** the optical energy on each fiber and sends the resultant signal along an umbilical link 4a to the HDT, and in the downstream direction **splits** the downstream optical signal on the fiber umbilical 4a into a number of identical optical signals a travelling along respective individual fibers 4." Column 9, lines 15-22. The cited passages of Graves merely describe a *passive optical* splitter/combiner. The Office Action is completely devoid of any explanation as to how this *passive optical* device is digitally summing as recited in the claims. Applicant respectfully submits that it is not.

In response, the Examiner asserts that the **combiner** of the *passive optical* splitter/combiner would "**adds** the optical energy on each fiber and sends the resultant signal along an umbilical link 4a to the HDT" as recited in the above paragraph. Here, digital **adding** would be the same as digital **summing**, noting that HDT is a host **digital** terminal.

The same argument regarding the "digital summing" as set forth above would apply equally well to claims 2-3, 5-16, 18-32, 34-64, 75-81 since no further arguments are provided by Applicant.

For foregoing reasons, the examiner believes that the pending claims (1-64, 75-81) are not allowable over the cited prior art.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. **Any response to this final action should be mailed to:**

Box A.F.

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Nay Maung (Supervisor) whose telephone number is (571) 272-7882.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	Art Unit
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
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	29	✓	✓							
	30	✓	✓							
	31	✓	✓							
	32	✓	✓							
	33	✓	✓							
	34	✓	✓							
	35	✓	✓							
	36	✓	✓							

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008							
	37	✓	✓							
	38	✓	✓							
	39	✓	✓							
	40	✓	✓							
	41	✓	✓							
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	66	=	=							
	67	=	=							
	68	=	=							
	69	=	=							
	70	O	=							
	71	O	=							
	72	O	=							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	**Art Unit**
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008	10/07/2008							
	73	O	=							
	74	=	=							
	75	✓	✓							
	76	✓	✓							
	77	✓	✓							
	78	✓	✓							
	79	✓	✓							
	80	✓	✓							
	81	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	Art Unit
	DUC M NGUYEN	2618

SEARCHED

Class	Subclass	Date	Examiner
455	7, 14-22, 553, 561, 3.01, 3.05	8/10/06	DN
370	906, 907, 498, 501, 535-537	8/10/06	DN
Updated	same as aboves	1/25/07	DN
		9/25/07	DN
		10/6/08	DN

SEARCH NOTES

Search Notes	Date	Examiner
see EAST search history	8/10/06	DN
	8/17/06	DN
	1/25/07	DN
	4/24/07	DN
	7/29/07	DN

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

	/DUC M NGUYEN/ Primary Examiner.Art Unit 2618

Applicant(s)	Wala	**AMENDMENT AND RESPONSE UNDER 37 C.F.R. § 1.111**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Confirmation No.	3898	
Examiner Name	Nguyen, Duc	
Group Art Unit	2618	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Office Action mailed on April 3, 2008 has been reviewed. Please amend the above-identified application as follows.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 25 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of claims:

1. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

2. (Original) The system of claim 1, further comprising a wireless interface device coupled to the digital host unit.

3. (Original) The system of claim 2, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

4. (Previously Presented) The system of claim 2, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

5. (Original) The system of claim 1, wherein the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals.

6. (Previously Presented) The system of claim 1, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

7. (Previously Presented) The system of claim 6, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

8. (Original) The system of claim 1, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

9. (Original) The system of claim 1, wherein the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair.

10. (Original) The system of claim 7, wherein the digital host unit further comprises an alarm/control interface circuit coupled to the multiplexer.

11. (Original) The system of claim 1, further comprising a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit.

12. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by a multimode fiber pair.

13. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by single mode fiber.

14. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit;

at least one digital expansion unit coupled to the digital host unit; and at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

15. (Original) The system of claim 14, further comprising a wireless interface device coupled to the digital host unit.

16. (Original) The system of claim 15, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

17. (Previously Presented) The system of claim 15, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

18. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the digital host unit.

19. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the at least one digital expansion unit.

20. (Original) The system of claim 14, wherein the at least one digital expansion units are each coupled to the digital host unit via a multimode fiber pair.

21. (Original) The system of claim 14, wherein the at least one digital expansion unit is coupled to the digital host unit via a single mode fiber.

22. (Previously Presented) The system of claim 14, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

23. (Previously Presented) The system of claim 22, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

24. (Original) The system of claim 14, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

25. (Previously Presented) A method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units;

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units;

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit;

receiving the multiple digital radio frequency signals at the digital host unit;

digitally summing the multiple digital radio frequency signals together; and

converting the summed multiple digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

26. (Original) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises amplifying the analog radio frequency signals.

27. (Previously Presented) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises synchronizing a reverse path local oscillator to a master clock so as to reduce end-to-end frequency translation.

28. (Previously Presented) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units;

receiving the digitized radio frequency spectrum at the plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

29. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum comprises amplifying the radio frequency signals.

30. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum digital radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

31. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises amplifying the analog radio frequency signals.

32. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

33. (Original) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit;

receiving the digitized radio frequency spectrum at the first plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units;

receiving the digital radio frequency signals at the at least one digital expansion unit;

optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units;

receiving the second digitized radio frequency spectrum at the second plurality of digital remote units;

converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

34. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the at

least two digital remote units each include:

a main radio frequency antenna;

a duplexer coupled to the main radio frequency antenna which receives

radio frequency signals in the reverse path and transmits radio frequency signals in the forward path;

a radio frequency to digital converter coupled to the duplexer in the reverse path;

a digital to radio frequency converter coupled to the duplexer in the forward path;

a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path;

an optical transmitter coupled to an output of the multiplexer chip set; and

an optical receiver coupled to an input of the multiplexer chip set;

wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

35. (Original) The system of claim 34, wherein the digital host unit includes an alarm/control interface circuit.

36. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit, wherein the digital host unit includes a channel summer to digitally sum digitized RF signals received at the digital host;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

37. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units.

38. (Previously Presented) The first unit of claim 37, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

39. (Previously Presented) The first unit of claim 37, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

40. (Previously Presented) The first unit of claim 37, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

41. (Previously Presented) The first unit of claim 37, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

42. (Previously Presented) The first unit of claim 37, further comprising:

a respective demultiplexer for each of the plurality of second units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of second units.

43. (Previously Presented) The first unit of claim 37, further comprising:

a multiplexer to produce a framed serial bit stream from the second digital samples, wherein the framed serial bit stream is communicated to the plurality of second units.

44. (Previously Presented) The first unit of claim 37, further comprising a clock recovery circuit.

45. (Previously Presented) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit; and

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency.

46. (Previously Presented) The system of claim 45, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

47. (Previously Presented) The system of claim 45, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

48. (Currently Amended) The system of claim 45, further comprising:

a respective demultiplexer for each of the plurality of other units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of other units.[[; and]]

49. (Previously Presented) The system of claim 45, further comprising:

a multiplexer to produce a framed serial bit stream from the other digital samples, wherein the framed serial bit stream is communicated to the plurality of other units.

50. (Previously Presented) The system of claim 45, further comprising a clock recovery circuit.

51. (Previously Presented) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples; and

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency.

52. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from an original downstream analog radio frequency signal;

a power distribution interface to provide power to at least one of the plurality of second units; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units.

53. (Previously Presented) The first unit of claim 52, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

54. (Previously Presented) The first unit of claim 52, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

55. (Previously Presented) The first unit of claim 52, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

56. (Previously Presented) The first unit of claim 52, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

57. (Previously Presented) The first unit of claim 52, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

58. (Previously Presented) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal;

a power distribution interface to provide power to at least one of the plurality of other units;

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

59. (Previously Presented) The system of claim 58, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

60. (Previously Presented) The system of claim 58, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

61. (Previously Presented) The system of claim 58, wherein the interface of the host unit is operable to communicatively couple the host unit to at least one other unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one other unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one other unit.

62. (Previously Presented) The system of claim 58, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

63. (Previously Presented) The system of claim 58, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

64. (Previously Presented) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples;

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

distributing power to at least one of the second units.

65. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer; and

wherein the second reference signal is generated by frequency dividing the first reference signal.

66. (Previously Presented) The first unit of claim 65, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;
wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

67. (Previously Presented) The first unit of claim 66, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

68. (Previously Presented) The first unit of claim 65, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

69. (Previously Presented) The first unit of claim 65, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

70. (Currently Amended) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;[[;]]

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer;

wherein the second reference signal is generated by frequency dividing the first reference signal;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

71. (Previously Presented) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;

wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

72. (Previously Presented) The system of claim 71, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

73. (Previously Presented) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

74. (Previously Presented) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples;

converting the stream of summed upstream digital RF samples to an analog signal;

mixing a signal derived from the analog signal is with a first reference signal to produce a first mixed signal;

mixing a signal derived from a first mixed signal with a second reference signal; and

generating the second reference signal by frequency dividing the first reference signal.

75. (Previously Presented) A first unit comprising:

an interface to communicatively couple the first unit to the plurality of second units using at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the first unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of second units; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units;

wherein sample rates used by the host unit and the other units are locked together.

76. (Previously Presented) The first unit of claim 75, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

77. (Previously Presented) The first unit of claim 75, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

78. (Previously Presented) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the host unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of other units; and

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein sample rates used by the host unit and the other units are locked together.

79. (Previously Presented) The system of claim 78, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

80. (Previously Presented) The system of claim 78, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

81. (Previously Presented) A first unit comprising:

means for communicatively coupling the first unit to a plurality of second units;

means for digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

means for communicating at least a portion of the downstream digital RF samples to the plurality of second units;

means for receiving from the plurality of second units respective upstream digital RF samples;

means for digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples; and

means for converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency.

REMARKS

The Office Action mailed on April 3, 2008 has been reviewed. Claim 70 has been amended. Claims 1-81 are pending in this application.

Claim Objections

Claim 70 was objected to because of informalities. Claim 70 has been amended to address this.

Rejections Under 35 U.S.C. § 102

Claims 37-40, 51, 53-55 were rejected under 35 USC § 102(b) as being anticipated by Chum, (U.S. Patent No. 4,667,319).

Claim 37 is:

> 37. (New) A first unit comprising:
> an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium;
> an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and
> a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and
> wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units; and
> wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units.

The Office Action took the position that the adder 55 shown in FIG. 2 of Chum is producing "summed upstream digital RF samples" as recited in claim 37 of the present application. However, Chum very clearly indicates that the adder 55 is not operating on radio frequency samples. Instead, Chum relates to a

technique in which the T/R 10 and T/R 12 demodulates and demultiplexes signals communicated on the transmission path 8 to extract a (baseband) service channel. See, e.g., Chum, column 3, lines 28-35. The adder 55 to which the Office Action refers combines data from a single, demodulated, demultiplexed basedband service channel.

The Office Action, in this regard, asserted that "the analog voice signals at voice frequency in Chum would read on the claimed analog radio frequency (RF) signals." Applicant respectfully traverses this statement. Voice signals are simply not analog radio frequency signals, and the Office Action is devoid of any explanation as to why this is case. Thus, Chum does not teach all of the features recited in claim 37.

Claims 38-40 depend from claim 37. Therefore, at least the same arguments set forth above with respect to claim 37 apply to these dependent claims. Since Applicant believes these dependent claims are allowable for the reasons given above with respect to claim 37, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

The Office Action rejected claims 51 and 53-55 for the same reasons as claims 37-39. Therefore, at least the same arguments set forth above with respect to claim 37 apply to these claims. Since Applicant believes these claims are allowable for the reasons given above with respect to claim 37, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Accordingly, Applicant respectfully requests the withdrawal of this rejection.

Rejections Under 35 U.S.C. § 103

Claims 45-46, 52, 58-62, 64 were rejected under 35 USC § 103(a) as being unpatentable over Chum (U.S. Patent No. 4,667,319).

The Office Action appears to have rejected claims 45-46, 52, 58-62, 64 for the same reasons as set forth above with respect to the Section 102 rejection. Therefore, it is respectfully submitted that at least the same arguments set forth above with respect to to the Section 102 rejection apply to these claims. Since Applicant believes these claims are allowable for the reasons given above, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Accordingly, Applicant respectfully requests the withdrawal of this rejection.

Claims 1-3, 5-16, 18-32, 34-64, 75-81 were rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Graves (U.S. Patent No. 6,198,558).

Claim recites, in part, "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit."

The Office Action conceded that Russell fails to teach this. The Office Action then went on to assert that:

> However, Russell fails to explicitly teach that the optical combiner 946 would digitally summing digitized RF signals from the DRTs. However, in an analogous art, Graves teaches an optical splitter/combiner that clearly adds digitized RF signals in the upstream direction (see Figs. 1 B, 2B, 3B regarding ref. 30 and col. 5, lines 23-27, col. 9, lines 15-22). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for digitally summing/adding digitized RF signals from two DRTs before converting to an analog signal, for reducing the amount of aggregated

> ingressive noise caused by AID converters and/or for cost saving (i.e, only one DIA converter is required for converting these two digital signals).

The portions of Graves cited in the Office Action in this regard are as follows: "A number of different ONUs in the same vicinity are grouped together by virtue of their associated distribution cables being joined together at a passive optical splitter 30 which is connected directly by means of an optical fiber umbilical 4a to a transceiver 16 of the HDT 1." Column 5, lines 23-27 and "Multiple optical fibers come together at a passive optical splitter 30, which in the upstream direction adds the optical energy on each fiber and sends the resultant signal along an umbilical link 4a to the HDT, and in the downstream direction splits the downstream optical signal on the fiber umbilical 4a into a number of identical optical signals a travelling along respective individual fibers 4." Column 9, lines 15-22. The cited passages of Graves merely describe a ***passive optical*** splitter/combiner. The Office Action is completely devoid of any explanation as to how this ***passive optical*** device is digitally summing as recited in the claims. Applicant respectfully submits that it is not.

Claims 2-3 and 5-13 all depend from claim 1. Therefore, at least the arguments set forth above with respect to claim 1 apply to these dependent claims as well. Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 14 as well. Claims 15-16 and 18-24 depend from claim 14, and, therefore, at least the same arguments set forth above with respect to claim 14 apply to these dependent claims as well. Since Applicant believes these claims are allowable for the reasons given above with

respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 25 and dependent claims 26-27 (which depend from claim 25). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 28 and dependent claims 29-30 (which depend from claim 28). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 34 and dependent claim 35 (which depends from claim 34). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 36. Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response.

Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 37 and dependent claims 38-44 (which depend from claim 37). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 45 and dependent claims 46-50 (which depend from claim 45). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 51. Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 52 and dependent claims 53-57 (which depend from claim 52). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 58 and dependent claims 59-63 (which depend from claim 58). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 64. Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 75 and dependent claims 76-77 (which depend from claim 75). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 78 and dependent claims 79-80 (which depend from claim 78). Since Applicant believes these claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to independent claim 81. Since Applicant believes these

claims are allowable for the reasons given above with respect to claim 1, specific arguments with respect to these claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Accordingly, Applicant respectfully requests the withdrawal of this rejection.

Claims 4, 17 were rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Graves (U.S. Patent No. 6,198,558) and further in view of Kallander et al. (U.S. Patent No. 5,603,080).

Claim 4 depends from independent claim 1, and claim 17 depends from independent claim 14. Therefore, Applicant respectfully submits that at least the arguments set forth above with respect claims 1 and 14 apply to these claims as well. Since Applicant believes these claims are allowable for the reasons given above, specific arguments with respect to these dependent claims have not been provided in this response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Accordingly, Applicant respectfully requests the withdrawal of this rejection.

Claim 33 was rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Graves (U.S. Patent No. 6,198,558) and further in view of Dail (U.S. Patent No. 5,765,097).

Claim 33 depends from independent claim 28. Therefore, Applicant respectfully submits that at least the arguments set forth above with respect claim 28 apply to these claims as well. Since Applicant believes these claims are allowable for the reasons given above with respect to claim 28, specific arguments with respect to this dependent claim have not been provided in this

response. Applicant, however, reserves the right to submit further arguments directed to these claims if a further response is required.

Accordingly, Applicant respectfully requests the withdrawal of this rejection.

Allowable Subject Matter

Claims 65-69, and 74 were allowed.

Claims 70-73 were indicated to be allowable if rewritten to overcome the rejection(s) under 35 USC § 112 set forth in the Office Action. Applicant submits that the amendment to claim 70 address the 112 issue noted above.

CONCLUSION

Applicant respectfully submits that claims **1-81** are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 2008-07-01

/Jon M. Powers/
Jon M. Powers
Reg. No. 43868

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Electronic Acknowledgement Receipt

EFS ID:	3550531
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	01-JUL-2008
Filing Date:	19-DEC-2003
Time Stamp:	16:47:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		00130517.PDF	138918 770a557a00ccf493aeb2a1b9d3d81db45a0653fc	yes	34

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment - After Non-Final Rejection	1	1
	Claims	2	24
	Applicant Arguments/Remarks Made in an Amendment	25	34
Warnings:			
Information:			
	Total Files Size (in bytes):	138918	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/740,944	12/19/2003	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 01/03/2008

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 81	Minus	** 36	= 45	X $ =		OR	X $50=	2250
Independent (37 CFR 1.16(h))	* 14	Minus	***7	= 7	X $ =		OR	X $210=	1470
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	3720

AMENDMENT 07/01/2008

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 81	Minus	** 81	= 0	X $ =		OR	X $50 =	0
Independent (37 CFR 1.16(h))	* 19	Minus	*** 14	= 5	X $ =		OR	X $210 =	1050
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	1050

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/GLENN BURNS JR/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

34206 7590 04/03/2008

FOGG & POWERS LLC
10 SOUTH FIFTH STREET
SUITE 1000
MINNEAPOLIS, MN 55402

EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

NOTIFICATION DATE	DELIVERY MODE
04/03/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@fogglaw.com

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	DUC M. NGUYEN	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-81* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *65-69 and 74* is/are allowed.

6)☒ Claim(s) *1-64 and 75-81* is/are rejected.

7)☒ Claim(s) *70-73* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/3/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to applicant's response filed on 1/3/08. Claims 1-81 are now pending in the present application.

Claim Objections

1. Claim 70 is objected to because of the following informalities: delete the extra ";" in line 18 of the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims **37-40, 51, 53-55** are rejected under 35 U.S.C. 102(b) as being anticipated by **Chum** (US Patent Number **4,667,319**).

Regarding claim **37, Chum** discloses a first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium (see Fig. 2, wherein the "branching circuit 9" would read on the "first unit", the "T/R 10 and T/R 12" would read on the "second units");

an analog-to-digital unit to digitize an original downstream analog radio frequency signal (39) in order to produce downstream digital RF samples 23, 31 (see Fig. 2, ref. ADC 42 and col. 3, lines 15-56); and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples (21, 33) to a replicated upstream analog radio frequency 41 (see Fig. 2, ref. DAC 44 and col. 3, lines 15-56); and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples (21, 33) received from the plurality of second units (see Fig. 2, ref. 55 and col. 3, lines 15-56); and

wherein the first unit communicates at least a portion of the downstream digital RF samples (23, 31) to the plurality of second units (see Fig. 2 and col. 3, lines 15-56).

Therefore, the claimed limitations are anticipated by Chum, noting that the analog voice signals at voice frequency in Chum would read on the claimed analog radio frequency (RF) signals.

Regarding claim **38, Chum** would teach the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable as claimed (see col. 2, lines 26-30).

Regarding claim **39, Chum** would teach the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit as claimed (see Fig. 2, regarding adders 50, 52, 55 and col. 2, lines 26-30).

Regarding claim **40,** with the broadest reasonable interpretation, the "branching unit" would read on the claimed "digital host unit" or "digital expansion unit".

Regarding claims **51, 53-55**, the claims are rejected for the same reason as set forth in claims **37-39** above.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims **45-46, 52, 58-62, 64** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Chum.**

Regarding claim **45,** the claim is rejected for the same reason as set forth in claim **40** above regarding the "host unit", wherein it would have been obvious that the system in Chum would be capable of distributing signals to a plurality of subscribers.

Regarding claim **46,** with the broadest reasonable interpretation, the "branching unit" would read on the claimed "digital host unit" or "digital expansion unit".

Regarding claim **52,** the claim is rejected for the same reason as set forth in claim **51** above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Chum**, for providing a power distribution

interface as claimed, as an obvious design choice in order to supply power to the T/R units for operation purpose.

Regarding claim **58,** the claim is rejected for the same reason as set forth in claims **45, 52** above.

Regarding claim **59,** the claim is rejected for the same reason as set forth in claim **58** above. In addition, Chum would teach an ADC as claimed (see Fig. 2, ref. 42).

Regarding claim **60, Chum** would teach the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable as claimed (see col. 2, lines 26-30).

Regarding claim **61, Chum** would teach the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit as claimed (see Fig. 2, regarding adders 50, 52, 55 and col. 2, lines 26-30).

Regarding claim **62,** with the broadest reasonable interpretation, the “branching unit” would read on the claimed “digital host unit” or “digital expansion unit”.

Regarding claim **64,** the claim is rejected for the same reason as set forth in claim **52** above regarding the power distribution limitation.

6. Claims **1-3, 5-16, 18-32, 34-64, 75-81** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** et al (US **5,644,622**) in view of **Graves** (US **6,198,558**).

Regarding claim **1, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Figs. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 would be shared by digital remote units 102.

However, **Russell** is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it would have been obvious that the downstream signal would be splitted in the forward path (i.e, downstream direction), and in the reverse path (or upstream direction) from a DRT 102 to the digital host unit 106, upstream signals from these two DRTs 102 (see Fig. 12) would obviously be combined/summed by an optical combiner 946 as shown in Fig. 44, wherein it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the optical combiner 946, the WDM 930 (see Fig. 44) as an integral part of the digital base station 106 (see Figs. 12, 14 regarding WDM 270 as a digital expansion

unit of the base station 106) since it has been held that forming in one piece an article which has formally been formed in two pieces and put together involves only routine skill in the art. Howard v. Detroit Stove Works, 150 U.S. 164 (1893).

However, **Russell** fails to explicitly teach that the optical combiner 946 would digitally summing digitized RF signals from the DRTs. However, in an analogous art, **Graves** teaches an optical splitter/combiner that **clearly adds** digitized RF signals in the upstream direction (see Figs. 1B, 2B, 3B regarding ref. 30 and col. 5, lines 23-27, **col. 9, lines 15-22**). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell**, for digitally summing/adding digitized RF signals from two DRTs before converting to an analog signal, for reducing the amount of aggregated ingressive noise caused by A/D converters and/or for cost saving (i.e, only one D/A converter is required for converting these two digital signals).

Regarding claim **2, Russell** would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim **3, Russell** would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim **5, Russell** would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim **6, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **7,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would obviously teach the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed as disclosed by **Graves** (see Figs. 1B, 2B, 3B regarding ref. 30 and col. 9, lines 15-22).

Regarding claim **8, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **9, Russell** would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim **10, Russell** would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim **11, Russell** would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the "digital expansion unit" as claimed (see col. 15, lines 25-36).

Regarding claim **12, Russell** would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim **14,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above.

Regarding claim **15,** the claim is interpreted and rejected for the same reason as set forth in claim **2** above.

Regarding claim **16,** the claim is interpreted and rejected for the same reason as set forth in claim **3** above.

Regarding claim **18, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim **19, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim **20,** the claim is interpreted and rejected for the same reason as set forth in claim **12** above.

Regarding claim **22, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **23,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim **24, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **28,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting the radio frequency signals to a digitized radio frequency spectrum (see Fig. 4 regarding broadband digitizer 132);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see Fig. 8 regarding D/A 164); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim **30,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the radio frequency signal to a digitized radio frequency sprectrum comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim **34,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **35,** the claim is interpreted and rejected for the same reason as set forth in claim **10** above regarding the “alarm/control interface”.

Regarding claim **36,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above regarding the "digital expansion unit".

Regarding claim **13,** although **Russell** would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim **21,** the claim is interpreted and rejected for the same reason as set forth in claim **13** above.

Regarding claim **25,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the “wireless interface device”).

Regarding claim **26,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim **27,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33,

line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **29, 31,** the claims are rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier during A/D and/or D/A conversions as claimed, for further improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim **32,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **37-64, 81**, the claims are interpreted and rejected for the same reason as set forth in claims **1-3, 5-16, 18-32, 34-36** above, wherein the DHT or base station would read on the claimed “first unit”, the DRT would read on the claimed “second units”.

Regarding claims **75-80**, the claims are interpreted and rejected for the same reason as set forth in claims **1-3, 5-16, 18-32, 34-36** above, wherein **Russell** would

obvious teach sample rates used by the host unit and remote units are locked together, in order to achieve synchronization as mentioned by **Russell** (see col. 12, lines 7-28).

7. Claims **4, 17,** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Graves** and further in view of **Kallander et al** (US Patent Number **5,603,080**).

Regarding claim **4,** it is rejected for the same reason as set forth in claim **2** above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, **Russell** fails to disclose a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that **Russell** also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed by **Kallander** (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by **Kallander** (see col. 4, lines 54-67) to compensate for propagation loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim **17,** the claim is interpreted and rejected for the same reason as set forth in claim **4** above.

8. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Graves** and further in view of **Dail** (US Patent Number **5,765,097**).

Regarding claim **33,** the claim is interpreted and rejected for the same reason as set forth in claim **28** above. However, Russell fails to disclose a further digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by **Dail** (see Fig. 2, ref. 220 and col. 4, line 28 – col. 5, line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Dail's teaching to Russell, for providing a further digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Allowable Subject Matter

9. Claims **65-69, 74** are allowed.

10. Claims **70-73** would be allowable if rewritten or amended to overcome the objections set forth in this Office action.

Response to Arguments

11. Applicant's arguments with respect to claims 1-81 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

12. **Any response to this action should be mailed to:**

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Nay Maung (Supervisor) whose telephone number is (571) 272-7882.

/Duc M. Nguyen/

Primary Examiner, Art Unit 2618

Mar 24, 2008

PTO/SB/08a (05-07)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	10740944
Filing Date	2003-12-19
First Named Inventor	Wala
Art Unit	2618
Examiner Name	Nguyen, Duc M.
Attorney Docket Number	100.019US02

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Filing Date	2003-12-19
	First Named Inventor	Wala
	Art Unit	2618
	Examiner Name	Nguyen, Duc M.
	Attorney Docket Number	100.019US02

/D.N./	1	WALA, "A New Microcell Architecture Using Digital Optical Transport ", "Freedom Through Wireless Technogolgy", 5/18/93, Page(s) 585-588, Publisher: Proceedings of the Vehicular Technology Conference, New York, IEEE, Published in: US	☐

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EXAMINER SIGNATURE

Examiner Signature	/Duc Nguyen/	Date Considered	03/10/2008

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10740944	WALA, PHILIP M.
	Examiner	Art Unit
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
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	36	✓								

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	Examiner	Art Unit
	DUC M NGUYEN	2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
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	Examiner	**Art Unit**
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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2008								
	73	O								
	74	=								
	75	✓								
	76	✓								
	77	✓								
	78	✓								
	79	✓								
	80	✓								
	81	✓								

PTO/SB/30EFS (05/07)
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	10/740,944	Filing Date	12/19/2003	Docket Number (if applicable)	100.019US02	Art Unit	2618
First Named Inventor	Wala			Examiner Name	Duc Nguyen		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 502432

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

Signature of Registered U.S. Patent Practitioner			
Signature	/Jon M. Powers/	Date (YYYY-MM-DD)	2008-01-03
Name	Jon M. Powers	Registration Number	43868

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Applicant(s)	Wala	**AMENDMENT AND RESPONSE**
Serial No.	10/740,944	
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Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Commissioner for Patents
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The Final Office Action mailed on October 3, 2007 has been reviewed.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 25 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of claims:

1. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

2. (Original) The system of claim 1, further comprising a wireless interface device coupled to the digital host unit.

3. (Original) The system of claim 2, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

4. (Previously Presented) The system of claim 2, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

5. (Original) The system of claim 1, wherein the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals.

6. (Previously Presented) The system of claim 1, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

7. (Previously Presented) The system of claim 6, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

8. (Original) The system of claim 1, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

9. (Original) The system of claim 1, wherein the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair.

10. (Original) The system of claim 7, wherein the digital host unit further comprises an alarm/control interface circuit coupled to the multiplexer.

11. (Original) The system of claim 1, further comprising a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit.

12. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by a multimode fiber pair.

13. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by single mode fiber.

14. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

15. (Original) The system of claim 14, further comprising a wireless interface device coupled to the digital host unit.

16. (Original) The system of claim 15, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

17. (Previously Presented) The system of claim 15, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier.

18. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the digital host unit.

19. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the at least one digital expansion unit.

20. (Original) The system of claim 14, wherein the at least one digital expansion units are each coupled to the digital host unit via a multimode fiber pair.

21. (Original) The system of claim 14, wherein the at least one digital expansion unit is coupled to the digital host unit via a single mode fiber.

22. (Previously Presented) The system of claim 14, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the digitized radio frequency signals.

23. (Previously Presented) The system of claim 22, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

24. (Original) The system of claim 14, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

25. (Previously Presented) A method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units;

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units;

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit;

receiving the multiple digital radio frequency signals at the digital host unit;

digitally summing the multiple digital radio frequency signals together; and

converting the summed multiple digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

26. (Original) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises amplifying the analog radio frequency signals.

27. (Previously Presented) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises synchronizing a reverse path local oscillator to a master clock so as to reduce end-to-end frequency translation.

28. (Previously Presented) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units;

receiving the digitized radio frequency spectrum at the plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

29. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum comprises amplifying the radio frequency signals.

30. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum digital radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

31. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises amplifying the analog radio frequency signals.

32. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

33. (Original) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit;

receiving the digitized radio frequency spectrum at the first plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units;

receiving the digital radio frequency signals at the at least one digital expansion unit;

optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units;

receiving the second digitized radio frequency spectrum at the second plurality of digital remote units;

converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

34. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the at

least two digital remote units each include:

a main radio frequency antenna;

a duplexer coupled to the main radio frequency antenna which receives

radio frequency signals in the reverse path and transmits radio frequency signals in the forward path;

a radio frequency to digital converter coupled to the duplexer in the reverse path;

a digital to radio frequency converter coupled to the duplexer in the forward path;

a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path;

an optical transmitter coupled to an output of the multiplexer chip set; and

an optical receiver coupled to an input of the multiplexer chip set;

wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

35. (Original) The system of claim 34, wherein the digital host unit includes an alarm/control interface circuit.

36. (Previously Presented) A digital radio frequency transport system, comprising:

a digital host unit, wherein the digital host unit includes a channel summer to digitally sum digitized RF signals received at the digital host;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

37. (New) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units.

38. (New) The first unit of claim 37, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

39. (New) The first unit of claim 37, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

40. (New) The first unit of claim 37, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

41. (New) The first unit of claim 37, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

42. (New) The first unit of claim 37, further comprising:

a respective demultiplexer for each of the plurality of second units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of second units.

43. (New) The first unit of claim 37, further comprising:

a multiplexer to produce a framed serial bit stream from the second digital samples, wherein the framed serial bit stream is communicated to the plurality of second units.

44. (New) The first unit of claim 37, further comprising a clock recovery circuit.

45. (New) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit; and

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency.

46. (New) The system of claim 45, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

47. (New) The system of claim 45, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

48. (New) The system of claim 45, further comprising:

a respective demultiplexer for each of the plurality of other units, wherein each of the demultiplexers extracts the first digital samples from a framed serial bit stream received from a respective one of the plurality of other units; and

49. (New) The system of claim 45, further comprising:

a multiplexer to produce a framed serial bit stream from the other digital samples, wherein the framed serial bit stream is communicated to the plurality of other units.

50. (New) The system of claim 45, further comprising a clock recovery circuit.

51. (New) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples; and

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency.

52. (New) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from an original downstream analog radio frequency signal;

a power distribution interface to provide power to at least one of the plurality of second units; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units.

53. (New) The first unit of claim 52, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

54. (New) The first unit of claim 52, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

55. (New) The first unit of claim 52, wherein the interface is operable to communicatively couple the first unit to at least one second unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one second unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one second unit.

56. (New) The first unit of claim 52, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

57. (New) The first unit of claim 52, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

58. (New) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal;

a power distribution interface to provide power to at least one of the plurality of other units;

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

59. (New) The system of claim 58, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

60. (New) The system of claim 58, wherein the communication medium comprises at least one of single mode optical fiber, multi-mode optical fiber, and coaxial cable.

61. (New) The system of claim 58, wherein the interface of the host unit is operable to communicatively couple the host unit to at least one other unit using a pair of optical fibers, wherein a first optical fiber included in the pair is used to communicate the at least a portion of the downstream digital RF samples to the at least one other unit and a second optical fiber included in the pair is used to receive respective upstream digital RF samples from the at least one other unit.

62. (New) The system of claim 58, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

63. (New) The system of claim 58, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

64. (New) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples;

converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

distributing power to at least one of the second units.

65. (New) A first unit comprising:

an interface to communicatively couple the first unit to a plurality of second units using at least one communication medium, wherein the first unit uses the interface to communicate to the plurality of second units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of second units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer; and

wherein the second reference signal is generated by frequency dividing the first reference signal.

66. (New) The first unit of claim 65, further comprising an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;

wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

67. (New) The first unit of claim 66, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

68. (New) The first unit of claim 65, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

69. (New) The first unit of claim 65, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

70. (New) A system for bi-directional radio frequency signal distribution comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium, wherein the host unit uses the interface to communicate to the plurality of other units downstream digital RF samples produced from an original downstream analog radio frequency signal; and

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein each of the summed upstream digital RF samples is produced by digitally summing respective upstream digital RF samples received from the plurality of other units;

wherein the digital-to-analog unit comprises a digital-to-analog converter, a first mixer, and a second mixer;;

wherein the stream of summed upstream digital RF samples is converted to an analog signal by the digital-to-analog converter;

wherein a signal derived from the analog signal is mixed with a first reference signal by the first mixer;

wherein a signal derived from a signal output by the first mixer is mixed with a second reference signal by the second mixer;

wherein the second reference signal is generated by frequency dividing the first reference signal;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein at least one of the other units is at least partially powered by power received from the host unit.

71. (New) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples, wherein the analog-to-digital unit comprises a third mixer, a fourth mixer, and an analog-to-digital converter;

wherein a signal derived from the original downstream analog radio frequency signal is mixed with a third reference signal by the third mixer;

wherein a signal derived from a signal output by the third mixer is mixed with the first reference signal by the fourth mixer; and

wherein a signal derived from a signal output by the fourth mixer is digitized to produce the downstream digital RF samples.

wherein the third reference signal is generated by frequency dividing the first reference signal.

72. (New) The system of claim 71, wherein the signal derived from the signal output by the fourth mixer that is digitized to produce the downstream digital RF samples is produced by adding dither to the signal output by fourth mixer.

73. (New) The system of claim 70, wherein the host unit further comprises an analog-to-digital unit to digitize the original downstream analog radio frequency signal in order to produce the downstream digital RF samples.

74. (New) A method comprising, at a first unit that is communicatively coupled to a plurality of second units, performing the following:

digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

communicating at least a portion of the downstream digital RF samples to the plurality of second units;

receiving from the plurality of second units respective upstream digital RF samples;

digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples;

converting the stream of summed upstream digital RF samples to an analog signal;

mixing a signal derived from the analog signal is with a first reference signal to produce a first mixed signal;

mixing a signal derived from a first mixed signal with a second reference signal; and

generating the second reference signal by frequency dividing the first reference signal.

75. (New) A first unit comprising:

an interface to communicatively couple the first unit to the plurality of second units using at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

a digital-to-analog unit to convert a stream of summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the first unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of second units; and

wherein the first unit communicates at least a portion of the downstream digital RF samples to the plurality of second units;

wherein sample rates used by the host unit and the other units are locked together.

76. (New) The first unit of claim 75, wherein the first unit comprises at least one of a digital host unit and a digital expansion unit.

77. (New) The first unit of claim 75, wherein each of the plurality of second units comprises at least one of a remote antenna unit and a remote expansion unit.

78. (New) A system for bi-directional radio frequency signal distribution system comprising:

a host unit; and

a plurality of other units communicatively coupled to the host unit using at least one communication medium;

wherein the host unit comprises:

an interface to communicatively couple the host unit to the plurality of other units using the at least one communication medium;

an analog-to-digital unit to digitize an original downstream analog radio frequency signal in order to produce downstream digital RF samples; and

a digital-to-analog unit to convert summed upstream digital RF samples to a replicated upstream analog radio frequency; and

wherein the host unit produces each of the summed upstream digital RF samples by digitally summing respective upstream digital RF samples received from the plurality of other units; and

wherein the host unit communicates at least a portion of the downstream digital RF samples to the plurality of other units;

wherein each of the other units digitizes an original upstream analog radio frequency in order to produce the upstream digital RF samples, at least a portion of which are communicated to the host unit;

wherein each of the other units convert the downstream digital RF samples received thereat to a replicated downstream analog radio frequency; and

wherein sample rates used by the host unit and the other units are locked together.

79. (New) The system of claim 78, wherein the host unit comprises at least one of a digital host unit and a digital expansion unit.

80. (New) The system of claim 78, wherein each of the plurality of other units comprises at least one of a remote antenna unit and a remote expansion unit.

81. (New) A first unit comprising:

means for communicatively coupling the first unit to a plurality of second units;

means for digitizing an original downstream analog radio frequency signal in order to produce downstream digital RF samples;

means for communicating at least a portion of the downstream digital RF samples to the plurality of second units;

means for receiving from the plurality of second units respective upstream digital RF samples;

means for digitally summing respective upstream digital RF samples received from the plurality of second units in order to produce each of a stream of summed upstream digital RF samples; and

means for converting the stream of summed upstream digital RF samples to a replicated upstream analog radio frequency.

REMARKS

The Final Office Action mailed on October 3, 2007 has been reviewed, along with the art cited. New claims 37-81 have been added. Therefore, claims 1-81 are now pending in this application.

Rejections Under 35 U.S.C. § 103

Claims 1-2, 5, and 7 were rejected under 35 USC § 103(a) as being unpatentable over Cook (U.S. Patent No. 6,005,884) in view of Schmutz et al. (U.S. Patent No. 6,262,981). Applicant respectfully traverses this rejection.

Claim 1 recites, in part, "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit."

In connection with making this rejection, the Office Action took the position that:

> Here, although the cited paragraph (col. 9, line 65 - col. 10, line 8) relate to the signal processor 28 in Fig.3, one skilled in' the art would recognize that the signal processor 28a in Fig. 4 would perform a similar function, namely a combining function, as of signal processor 28 mentioned in Fig. 3. Therefore, it is clear that Cook would obviously, if not implicitly, teach a digital adder/summer for combining the digital signals in the similar way as disclosed by Schmutz (see Figs. 2-3 and col. 6, lines 10-17, 44-59 regarding the combiner 280). Therefore, the claimed limitation regarding a digital summer/adder is made obvious by Cook and Schmutz.

Final Office Action, page 3.

Cook nowhere states that combining is performed by the signal processor 28a of FIG. 4. The Office Action essentially reasons that it would have been obvious to have the processor 28a of FIG. 4 of Cook perform a combining function in the particular manner recited in claim 1 of the present application

because Cook describes a different, analog combining function that is performed by signal processor 28 of FIG. 3 in an analog embodiment.

Applicant respectfully traverses such reasoning.

First, it is respectfully submitted that it would not have been clear to one of ordinary skill in the art why a combining function would need to be performed in the receive path of the embodiment shown in FIG. 4 at all since that embodiment makes use of an all-digital base station (in particular, the transceiver 30b is a digital transceiver). In this regard it is noted that an analog transceiver 30 is used in the analog embodiment of FIG. 3 of Cook.

Second, even if it would have been obvious to have the signal processor 28a of FIG. 4 perform some type of "combining" function (that is, producing a single digital signal from multiple digital signals), it is not clear why the particular technique recited in claim 1 of the present application (that is, digital summation) would have been obvious. It is respectfully submitted that other techniques existed for producing a single digital signal from multiple digital signals (e.g., multiplexing, selection, etc.). See, also, the discussion with respect to the Chum and Russell patents set forth below.

Third, the combiner 280 of Schmutz does not sum digitized radio frequency signals. Instead, the combiner 280 is part of the transmit path of a base station transceiver, which happens to perform its combining before any radio frequency signal is created. It is respectfully submitted that one of ordinary skill in the art would not look at a teaching relating to the transmit path of a base station transceiver (which employs, for example, an inverse FFT) for a receive path operation performed by the signal processor 28a of Cook (where there appears to be no need for an inverse FFT).

Furthermore, as previously noted, claim 1 of the present application recites, in relevant part, "wherein the digital host unit includes shared circuitry that performs *bi-directional* ***simultaneous*** digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two

digital remote units". As previously argued, Cook fails to teach this since Cook explicitly teaches a half-duplex system.

In response to this argument by Applicant, the Office Action states:

> As to limitation regarding the "simultaneous" feature, it is noted that such feature is a well known feature of a duplex communication system. Since one skilled in the art would recognize the benefit of Cook's teaching and that the radio frequency distribution of digitized RF signals in Cook would applicable to a duplex communication system and would work equally well, it would have been obvious to one skilled in the art at the time the invention was made to modify Cook to provide a bi-directional simultaneous communication as claimed in a duplex communication system (i.e, a cellular system) as well, for extending coverage area of a duplex communication system such as a cellular system. Also note that it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham, 2 USPQ2d 1647 (1987).

Final Office Action, page 3.

It is noted that the response to Applicant's argument that is set forth in the Final Office Action fails to explain how the proposed combination/modification would teach or suggest the actual feature that is recited in claim 1 of the present application. Even if full-duplex communication systems were known, that would not make it obvious to modify the systems of Cook to include a digital host unit that "includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units" as recited in claim 1 of the present application. For example, the Office Action is devoid of any explanation as to how the proposed combination/modification teaches or suggests the "shared circuitry" recited in claim 1.

With respect to the statement that "it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed

does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations", it is not clear what is being referred to. The claim language noted above is not a recitation of an intended use but clearly describes features of shared circuitry included in the digital host.

Claims 2, 5 and 7 all depend from claim 1.

Applicant respectfully requests withdrawal of this rejection.

Claims 14, 25, 28, 33, 34, and 36 were rejected under 35 USC § 103(a) as being unpatentable over Cook in view of Schmutz and in further view of Russell et al. (U.S. Patent No. 5,644,622). Applicant respectfully traverses this rejection.

The Office Action applied to this rejection the same reasoning used to reject claim 1 based on Cook in view of Schmutz. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this rejection as well. Accordingly, Applicant respectfully requests withdrawal of this rejection.

Claims 1-2, 5, and 7 were rejected under 35 USC § 103(a) as being unpatentable over Cook (U.S. Patent No. 6,005,884) in view of Chum et al. (U.S. Patent No. 4,667,319).

The Office Action applied to this rejection similar reasoning as was used to reject claim 1 based on Cook in view of Schmutz except that the Office Action used Chum instead of Schmutz as the secondary reference. It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this rejection as well.

Moreover, Chum actually supports Applicant's arguments. Chum relates to a technique in which the T/R 10 and T/R 12 demodulates and demultiplexes signals communicated on the transmission path 8 to extract a (baseband) service channel. *See, e.g.,* Chum, column 3, lines 28-35. The adder 55 to which the Office Action refers combines data from a single, demodulated, demultiplexed basedband service channel. In other words, Chum teaches away from the

claimed feature of "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit." Thus, even if it would have been obvious to have the signal processor 28a of FIG. 4 of Cook perform some type of "combining" function (that is, producing a single digital signal from multiple digital signals), it is not clear why the particular technique recited in claim 1 of the present application (that is, digital summation) would have been obvious since Chum teaches an alternative technique. This is similar to the technique described in the Russell patent in connection with FIGS. 39A-39B thereof.

Accordingly, Applicant respectfully requests withdrawal of this rejection.

Claims 14, 25, 28, 33, 34, and 36 were rejected under 35 USC § 103(a) as being unpatentable over Cook (U.S. Patent No. 6,005,884) in view of Chum et al. (U.S. Patent No.4,667,319) and further in view of Russell (U.S. Patent No. 5,644,622). Applicant respectfully traverses this rejection.

It is respectfully submitted that the arguments set forth above with respect to the previous rejection of these claims apply to this rejection as well. Applicant respectfully requests withdrawal of this rejection.

Claims 1-3, 5-16, 18-32, and 34-36 were rejected under 35 USC § 103(a) as being unpatentable over Russell (U.S. Patent No. 5,644,622) in view of Chum et al. (U.S. Patent No. 4,667,319) and/or Cook (U.S. Patent No. 6,005,884). Applicant respectfully traverses this rejection.

In connection with the rejection of claim 1, the Office Action stated:

> However, Russell is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, or be modified to, be summed by a summing node, locate inside the digital transceiver unit 130 or before the analog (+) node in Fig. 13, in

> order to produce a single digital output signal in the similar way as disclosed by Chum (see Fig. 2, col. 3, lines 15-43) and/or Cook (see Fig. 4 regarding signal processor 28a and cot. 9, line 65 - col. 10, line 8. See also col. 17, lines 23- 37 regarding digitized signals for the base station 12c) so that this single digital output signal could be converted to an analog signal with a single DAC converter. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for digitally summing digitized RF signals from two DRT before converting to an analog signal for summing with an external RF analog signal in Fig. 13, for cost saving (i.e, minimize number of conversions required for converting these two digital signals, see Chum, col. 3, lines 16-17).

Final Office Action, pages 8-9.

Applicant respectfully traverses the statement in the Office Action that "*However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, or be modified to, be summed by a summing node, locate inside the digital transceiver unit 130 or before the analog (+) node in Fig. 13, in order to produce a single digital output signal in the similar way as disclosed by Chum (see Fig. 2, col. 3, lines 15-43) and/or Cook (see Fig. 4 regarding signal processor 28a and col. 9, line 65 - col. 10, line 8. See also col. 17, lines 23- 37 regarding digitized signals for the base station 12c) so that this single digital output signal could be converted to an analog signal with a single DAC converter.*".

First, as noted above, neither Chum nor Cook teach or suggest "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit" and both teach away therefrom. The adder 55 in Chum to which the Office Action refers combines data from a single, demodulated, demultiplexed basedband service channel. As noted above, Cook is completely silent as to digital summation. Moreover, it is noted that no D/A converter is used

in Cook since Cook employs a digital transceiver (which addresses the rationale set forth in the Final Office Action for the proposed combination).

Second, the proposed combination/modification is contrary to what is actually taught in Russell. It is respectfully submitted that any combination of signals from the multiple DRTs 102 would be done using the analog node in FIG. 13 as is actually shown therein. In that way, signals from both the DRTs 102 and the main antenna 250 (FIG. 12) can be combined.

Third, it is noted that it is simply not the case that one of ordinary skill in the art would have assumed that using digital RF transport to and from multiple remotes somehow always required the use of digital summation as recited in claim 1 of the present application. Indeed, the embodiments shown in FIGS. 39A-39B of Russell show alternatives in which each digitized RF signal received from each of multiple remotes is separately digitally demodulated and the resulting demodulated digital voice/data from all of the multiple remotes are then processed by a selector/processor 880. Note that no D/A converter is used (which addresses the rationale set forth in the Final Office Action for the proposed combination).

Claims 2-3, 5-13 depend from claim1. Therefore, at least the arguments set forth above with respect to claim 1 apply to these claims as well.

Claim 14 was apparently rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 15-16 and 18-24 depend from claim 14. Therefore, at least the arguments set forth with respect to claim 14 apply to these claims as well.

Claim 25 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 26-27 depend from claim 25. Therefore, at least the arguments set forth with respect to claim 25 apply to these claims as well.

Claim 28 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 29-32 depend from claim 28. Therefore, at least the arguments set forth with respect to claim 28 apply to these claims as well.

Claim 34 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claim 35 depends from claim 34. Therefore, at least the arguments set forth with respect to claim 34 apply to claim 35 as well.

Claim 36 was apparently rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well.

Applicant respectfully requests withdrawal of this rejection.

Claims 4 and 17 were rejected under 35 USC § 103(a) as being unpatentable over Russell (U.S. Patent No. 5,644,622) in view of Chum et al. (U.S. Patent No. 4,667,319) and Cook (U.S. Patent No. 6,005,884) and further in view of Kallander (U.S. Patent No. 5,603,080). Applicant respectfully traverses this rejection.

Claim 4 depends from claim 1. Accordingly, at least the arguments set forth above with respect to claim 1 apply to claim 4 as well. Claim 17 depends from claim 14. Accordingly, at least the arguments set forth above with respect to claim 14 apply to claim 17 as well.

Applicant respectfully requests withdrawal of this rejection.

Claim 33 is rejected under 35 USC § 103(a) as being unpatentable over Russell (U.S. Patent No. 5,644,622) in view of Chum et al. (U.S. Patent No. 4,667,319) and Cook (U.S. Patent No. 6,005,884) and further in view of Dail (U.S. Patent No. 5,765,097). Applicant respectfully traverses this rejection.

Claim 33 was rejected using the same reasoning as was used in rejecting claim 28. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 28 apply to this claim as well.

Applicant respectfully requests withdrawal of this rejection.

New Claims

Claims 37-81 have been added. It is respectfully submitted that these new claims are in condition for allowance and notification to that effect is earnestly requested.

CONCLUSION

Applicant respectfully submits that claims 1-81 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 2007-01-03

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PTO/SB/08a (05-07)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	10740944
Filing Date	2003-12-19
First Named Inventor	Wala
Art Unit	2618
Examiner Name	Nguyen, Duc M.
Attorney Docket Number	100.019US02

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	10740944
	Filing Date	2003-12-19
	First Named Inventor	Wala
	Art Unit	2618
	Examiner Name	Nguyen, Duc M.
	Attorney Docket Number	100.019US02

	1	WALA, "A New Microcell Architecture Using Digital Optical Transport ", "Freedom Through Wireless Technogolgy", 5/18/93, Page(s) 585-588, Publisher: Proceedings of the Vehicular Technology Conference, New York, IEEE, Published in: US	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	10740944
	Filing Date	2003-12-19
	First Named Inventor	Wala
	Art Unit	2618
	Examiner Name	Nguyen, Duc M.
	Attorney Docket Number	100.019US02

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jon M. Powers/	Date (YYYY-MM-DD)	2008-01-03
Name/Print	Powers, Jon M.	Registration Number	43868

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	10740944
Filing Date:	19-Dec-2003
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Filer:	Jon M. Powers/Lisa Gentry
Attorney Docket Number:	100.019US02

Filed as Large Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1202	45	50	2250
Independent claims in excess of 3	1201	12	210	2520
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
Request for continued examination	1801	1	810	810
		Total in USD ($)		**5580**

Electronic Acknowledgement Receipt

EFS ID:	2664860
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	03-JAN-2008
Filing Date:	19-DEC-2003
Time Stamp:	15:21:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$5580
RAM confirmation Number	699
Deposit Account	502432
Authorized User	POWERS,JON M.

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Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	00112420.PDF	737713 5ad479c00c42d406cf9f1659babda0771aff9e19	no	3
Warnings:					
Information:					
2		00112453.PDF	155520 a3c69cd3ccbd23c6b40192caa1d2c2279b88ae1e	yes	34

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Claims	2	24
Applicant Arguments/Remarks Made in an Amendment	25	34

Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Filed	00112421.PDF	794979 1b700ad4cbfcb307f9f8622d8d1e23f63659fedc	no	4
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4	NPL Documents	00112419.PDF	329199 6c9bbb64b383145f3cf6c01057d47676fb0aa8ca	no	5
Warnings:					
Information:					
5	Fee Worksheet (PTO-06)	fee-info.pdf	8440 6a32db52e803bce0f2f1086778699071687fc3f7	no	2
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/740,944	12/19/2003	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 01/03/2008	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 81	Minus	** 36	= 45	X $ =		OR	X $50=	2250
Independent (37 CFR 1.16(h))	* 14	Minus	***7	= 7	X $ =		OR	X $210=	1470
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	3720

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
Karen Vestal

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

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EXAMINER	
NGUYEN, DUC M	
ART UNIT	**PAPER NUMBER**
2618	

NOTIFICATION DATE	DELIVERY MODE
10/03/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@fogglaw.com

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	Duc M. Nguyen	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *9/18/2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to applicant's response filed on 9/18/07. Claims 1-36 are now pending in the present application. **This action is made final**.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims **1-2, 5, 7** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** (US **6,005,884**) in view of **Schmutz** et al (US **6,262,981**).

Regarding claim **1, Cook** discloses a digital radio frequency transport system, comprising:

a digital host unit 12c (see Fig 4 regarding base station 12c and col. 17, lines 23-37); and

at least two digital remote units (repeater 18b) coupled to the digital host unit (see Fig. 4), wherein the digital host unit includes shared circuitry (see Fig. 4, references 28a, 30b, 34a) that performs bi-directional digital radio frequency distribution of digitized RF signals between the digital host unit and the at least two digital remote units, wherein the digital host unit digitally sums the digitized RF signal received at the digital host unit (see col. 9, line 65 – col. 10, line 8).

Here, although the cited paragraph (col. 9, line 65 – col. 10, line 8) relate to the signal processor 28 in Fig.3, one skilled in the art would recognize that the signal processor 28a in Fig. 4 would perform a similar function, namely a combining function, as of signal processor 28 mentioned in Fig. 3. Therefore, it is clear that **Cook** would obviously, if not implicitly, teach a digital adder/summer for combining the digital signals in the similar way as disclosed by **Schmutz** (see Figs. 2-3 and col. 6, lines 10-17, 44-59 regarding the combiner 280). Therefore, the claimed limitation regarding a digital summer/adder is made obvious by Cook and Schmutz.

As to limitation regarding the "simultaneous" feature, it is noted that such feature is a well known feature of a duplex communication system. Since one skilled in the art would recognize the benefit of Cook's teaching and that the radio frequency distribution of digitized RF signals in Cook would applicable to a duplex communication system and would work equally well, it would have been obvious to one skilled in the art at the time the invention was made to modify Cook to provide a bi-directional simultaneous communication as claimed in a duplex communication system (i.e, a cellular system) as well, for extending coverage area of a duplex communication system such as a cellular system. Also note that it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations *Ex parte Masham* 2 USPQ2d 1647 1987).

Regarding claim **2, Cook** would disclose a wireless interface device coupled to the digital host unit as claimed (see Fig. 4 regarding ref. 34a).

Regarding claim **5, Cook** would disclose a main RF antenna as claimed (see Fig. 4, ref. 24).

Regarding claim **7, Cook** would teach a multiplexer for splitting the signal as claimed (see Fig. 4, ref. 28 and col. 9, line 65 – col. 10, line 8 and col. 5, lines 15-16).

3. Claims **14, 25, 28, 33, 34, 36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** in view of **Schmutz** and further in view of **Russell** et al (US **5,644,622**).

Regarding claims **14, 36,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Cook** to further provide a digital expansion unit as disclosed by **Russell** (see Figs. 12, 14 regarding ref. 270 and col. 15, lines 25-35) so that a single optical fiber can be used in place of a pair of optical fiber, for cost saving.

Regarding claims **25, 28, 33, 34,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. However, Cook fails to teach an RF analog signal protocol format for the communication interface 34 that converts digitized RF signal to another protocol format associated with the host computer 14 and vice versa (see col. 10, lines 8-48). However, in an analogous art, Russell teaches a base station wherein such signal protocol format is an RF analog signal (see Figs. 2-3 and 21A, 21B). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Russell's teaching to modify Cook to

provide an MTSO in Cook, thereby providing an RF analog signal as another signal protocol format. By doing so, the communication interface 34 as modified would comprise ADC and DAC for the base station as well, in order to transport RF signals between remote terminals and the MTSO.

4. Claims **1-2, 5, 7** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** (US **6,005,884**) in view of **Chum** et al (US **4,667,319**).

Regarding claim **1, Cook** discloses a digital radio frequency transport system, comprising:

a digital host unit 12c (see Fig 4 regarding base station 12c and col. 17, lines 23-37); and

at least two digital remote units (repeater 18b) coupled to the digital host unit (see Fig. 4), wherein the digital host unit includes shared circuitry (see Fig. 4, references 28a, 30b, 34a) that performs bi-directional digital radio frequency distribution of digitized RF signals between the digital host unit and the at least two digital remote units, wherein the digital host unit digitally sums the digitized RF signal received at the digital host unit (see col. 9, line 65 – col. 10, line 8).

Here, although the cited paragraph (col. 9, line 65 – col. 10, line 8) relate to the signal processor 28 in Fig.3, one skilled in the art would recognize that the signal processor 28a in Fig. 4 would perform a similar function, namely a combining function, as of signal processor 28 detailed in Fig. 3. Therefore, it is clear that **Cook** would obviously, if not implicitly, teach a digital adder/summer for combining the digital signals

in the similar way as disclosed by **Chum** (see Fig. 2, col. 3, lines 28-43). Therefore, the claimed limitation regarding a digital summer/adder is made obvious by Cook and Chum.

As to limitation regarding the "simultaneous" feature, it is noted that such feature is a well known feature of a duplex communication system. Since one skilled in the art would recognize the benefit of Cook's teaching and that the digital radio frequency distribution of digitized RF signals in Cook would applicable to a duplex communication system and would work equally well, it would have been obvious to one skilled in the art at the time the invention was made to modify Cook to provide a bi-directional simultaneous communication as claimed in a duplex communication system (i.e, a cellular system) as well, for extending coverage area of a duplex communication system such as a cellular system. Also note that it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations *Ex parte Masham* 2 USPQ2d 1647 1987).

Regarding claim **2, Cook** would disclose a wireless interface device coupled to the digital host unit as claimed (see Fig. 4 regarding ref. 34a).

Regarding claim **5, Cook** would disclose a main RF antenna as claimed (see Fig. 4, ref. 24).

Regarding claim **7, Cook** would teach a multiplexer for splitting the signal as claimed (see Fig. 4, ref. 28 and col. 9, line 65 – col. 10, line 8 and col. 5, lines 15-16).

5. Claims **14, 25, 28, 33, 34, 36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** in view of **Chum** and further in view of **Russell** et al (US **5,644,622**).

Regarding claims **14, 36,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Cook** to further provide a digital expansion unit as disclosed by **Russell** (see Figs. 12, 14 regarding ref. 270 and col. 15, lines 25-35) so that a single optical fiber can be used in place of a pair of optical fiber, for cost saving.

Regarding claims **25, 28, 33, 34,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. However, Cook fails to teach an RF analog signal protocol format for the communication interface 34 that converts digitized RF signal to another protocol format associated with the host computer 14 and vice versa (see col. 10, lines 8-48). However, in an analogous art, Russell teaches a base station wherein such signal protocol format is an RF analog signal (see Figs. 2-3 and 21A, 21B). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Russell's teaching to modify Cook to provide an MTSO in Cook, thereby providing an RF analog signal as another signal protocol format. By doing so, the communication interface 34 as modified would comprise ADC and DAC for the base station as well, in order to transport RF signals between remote terminals and the MTSO.

6. Claims **1-3, 5-16, 18-32, 34-36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** et al (US **5,644,622**) in view of **Chum** and/or **Cook**.

Regarding claim **1, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

However, **Russell** is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, or be modified to, be summed by a summing node, locate inside the digital transceiver unit 130 or before the analog (+) node in Fig. 13, in order to produce a single digital output signal in the similar way as disclosed by **Chum** (see Fig. 2, col. 3, lines 15-43) and/or **Cook** (see Fig. 4 regarding signal processor 28a and col. 9, line 65 – col. 10, line 8. See also col. 17, lines 23- 37 regarding digitized signals for the base station 12c) so that this single digital output signal could be converted to an analog signal with a single DAC converter. Therefore, it would have been obvious to

one of ordinary skill in the art at the time the invention was made to modify **Russell**, for digitally summing digitized RF signals from two DRT before converting to an analog signal for summing with an external RF analog signal in Fig. 13, for cost saving (i.e, minimize number of conversions required for converting these two digital signals, see **Chum**, col. 3, lines 16-17).

Regarding claim **2, Russell** would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim **3, Russell** would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim **5, Russell** would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim **6, Russell** would disclose the digital host unit includes a radio 3frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **7,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to

the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed.

Regarding claim **8, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **9, Russell** would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim **10, Russell** would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim **11, Russell** would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the "digital expansion unit" as claimed (see col. 15, lines 25-36).

Regarding claim **12, Russell** would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim **14,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above.

Regarding claim **15,** the claim is interpreted and rejected for the same reason as set forth in claim **2** above.

Regarding claim **16,** the claim is interpreted and rejected for the same reason as set forth in claim **3** above.

Regarding claim **18, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim **19, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim **20,** the claim is interpreted and rejected for the same reason as set forth in claim **12** above.

Regarding claim **22, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **23,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly

disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim **24, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **28,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting the radio frequency signals to a digitized radio frequency spectrum (see Fig. 4 regarding broadband digitizer 132);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see Fig. 8 regarding D/A 164); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim **30,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the radio frequency signal to a digitized radio frequency sprectrum comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim **34,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **35,** the claim is interpreted and rejected for the same reason as set forth in claim **10** above regarding the "alarm/control interface".

Regarding claim **36,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above regarding the "digital expansion unit".

Regarding claim **13,** although **Russell** would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify

Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim **21,** the claim is interpreted and rejected for the same reason as set forth in claim **13** above.

Regarding claim **25,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the "wireless interface device").

Regarding claim **26,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim **27,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **29, 31,** the claims are rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier during A/D and/or D/A conversions as claimed, for

improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim **32,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

7. Claims **4, 17,** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Chum** and **Cook** and further in view of **Kallander et al** (US Patent Number **5,603,080**).

Regarding claim **4,** it is rejected for the same reason as set forth in claim **2** above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, **Russell** fails to disclose a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that **Russell** also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed

by **Kallander** (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by **Kallander** (see col. 4, lines 54-67) to compensate for propagation loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim **17,** the claim is interpreted and rejected for the same reason as set forth in claim **4** above.

8. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Chum**, **Cook** and further in view of **Dail** (US Patent Number **5,765,097**).

Regarding claim **33,** the claim is interpreted and rejected for the same reason as set forth in claim **28** above. However, Russell fails to disclose a digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by **Dail** (see Fig. 2, ref. 220 and col. 4, line 28 – col. 5, line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Dail's teaching to Russell, for providing a digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Response to Arguments

9. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

See the attached PTO-892.

12. **Any response to this final action should be mailed to:**

Box A.F.

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Matthew Anderson (Supervisor) whose telephone number is (571) 272-4177.

Duc M. Nguyen, P.E.

Sept 26, 2007

Notice of References Cited	Application/Control No. 10/740,944	Applicant(s)/Patent Under Reexamination WALA, PHILIP M.	
	Examiner Duc M. Nguyen	Art Unit 2618	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,667,319	05-1987	Chum, Stanley P. K.	370/260
*	B	US-6,337,754	01-2002	Imajo, Yoshihiro	398/115
*	C	US-2003/0143947	07-2003	Lyu, Jae Woo	455/7
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/740,944	WALA, PHILIP M.
Examiner	**Art Unit**
Duc M. Nguyen	2618

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

Claim		Date								
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Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
10/740,944	WALA, PHILIP M.	
Examiner	**Art Unit**	
Duc M. Nguyen	2618	

SEARCHED

Class	Subclass	Date	Examiner
455	7 14->22	8/10/2006	DN
	553 561		
	3.01 3.05		
370	908		
	907		
	498 501		
	535->537	8/10/2006	DN
Updated		1/25/07	DN
Updated		2/9/07	DN

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)

	DATE	EXMR
EAST	8/10/2006	DN
EAST	8/17/2006	DN
EAST	1/25/07	DN
EAST	4/24/07	DN
EAST	7/9/07	DN

Applicant(s)	Wala	**AMENDMENT AND RESPONSE UNDER 37 C.F.R. § 1.116 EXPEDITED EXAMINATION PROCEDURE**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Group Art Unit	2618	
Examiner Name	Nguyen, Duc M.	
Confirmation No.	3898	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Final Office Action mailed on July 18, 2007 has been reviewed.

Remarks begin on page 2 of this paper.

REMARKS

The Final Office Action mailed on July 18, 2007 has been reviewed, along with the art cited. Claims 1-36 are pending in this application. Reconsideration of the outstanding rejections is hereby requested.

Rejections Under 35 U.S.C. § 103

Claims 1-2, 5, and 7 were rejected under 35 USC § 103(a) as being unpatentable over Cook (U.S. Patent No. 6,005,884) in view of Schmutz et al. (U.S. Patent No. 6,262,981). Applicant respectfully traverses this rejection.

Claim 1 of the present application recites, in relevant part, "wherein the digital host unit includes shared circuitry that performs *bi-directional* ***simultaneous*** digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units".

The Final Office Action took the position that Cook teaches this (in particular, at col. 9, line 65 - col. 10, line 8). However, Applicant respectfully traverses this assertion. The cited portion of Cook states: "The signal processor 28 can operate as a signal combiner by combining all signals output from the communications links 26 to generate a summed signal for distribution via the signal path 32. In addition, the signal processor 28 can operate as a signal divider by accepting a signal from the transceiver 30 and dividing this signal for distribution to each of the first communication links 26. Consequently, it will be appreciated that the signal processor 28 performs the functions commonly associated with a conventional RF component, a signal combiner/divider." Nowhere does this teach or suggest the underline feature of claim 1 noted above. Indeed, Cook clearly teaches away from such an approach. For example, Cook states "Also, the data communications system of the present invention is a half-duplex communications system, whereas a cellular radiotelephone system operates as an apparent full-duplex communications system." Cook, column 35, lines 39-42. See, also, Cook, column 25,

line 38 – 54 (describing support for half-duplex operation of an analog-combiner signal processor 28 and noting that the transceiver operates in either a transmit mode or a receive mode).

Claims 2, 5 and 7 all depend from claim 1.

Applicant respectfully requests withdrawal of this rejection.

Claims 14, 25, 28, 33, 34, and 36 were rejected under 35 USC § 103(a) as being unpatentable over Cook in view of Schmutz and in further view of Russell et al. (U.S. Patent No. 5,644,622). Applicant respectfully traverses this rejection.

The Office Action applied the same reasoning used to reject claim 1 to this rejection. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this rejection as well. Applicant respectfully requests withdrawal of this rejection.

Claims 1-2, 5, and 7 were rejected under 35 USC § 103(a) as being unpatentable over Cook (U.S. Patent No. 6,005,884) in view of Lovinggood et al. (U.S. Patent No. 6,697,603).

It is respectfully submitted that the arguments set forth above with respect to the previous rejection of these claims apply to this rejection as well. Applicant respectfully requests withdrawal of this rejection.

Claims 14, 25, 28, 33, 34, and 36 were rejected under 35 USC § 103(a) as being unpatentable over Cook (U.S. Patent No. 6,005,884) in view of Lovinggood et al. (U.S. Patent No. 6,697,603) and further in view of Russell (U.S. Patent No. 5,644,622). Applicant respectfully traverses this rejection.

It is respectfully submitted that the arguments set forth above with respect to the previous rejection of these claims apply to this rejection as well. Applicant respectfully requests withdrawal of this rejection.

Claims 1-3, 5-16, 18-32, and 34-36 were rejected under 35 USC § 103(a) as being unpatentable over Russell (U.S. Patent No. 5,644,622) in view of Lovinggood et al. (U.S. Patent No. 6,697,603) and Cook (U.S. Patent No. 6,005,884). Applicant respectfully traverses this rejection.

The Office Action took the position that: "*However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, or be modified to, be summed by a summing node, locate inside the digital transceiver unit 130 or before the analog (+) node in Fig. 13, in order to produce a single digital output signal in the similar way as disclosed by Lovinggod (see col. 5, lines 20-24) and Cook (see Fig. 4 regarding signal processor 28a and col. 9, line 65 - col. 10, line 8. See also col. 17, lines 23- 37 regarding digitized signals for the base station 12c) so that this single digital output signal could be converted to an analog signal with a single DAC converter. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for digitally summing digitized RF signals from two DRT before converting to an analog signal for summing with an external RF analog signal in Fig. 13, for cost saving (i.e, only one D/A converter is required for converting these two digital signals).*"

As noted above, the alleged digital combiner of Cook is half-duplex and, by its own terms, is not intended for use in a cellular system (such as Russell).

Also, it is noted that Lovinggod does NOT relate to the use of its alleged digital summation technique to combine RF signals received from multiple, different remote antenna units. Instead, it relates to a four channel digital repeater in which, for each direction, a single incoming RF signal is split into four separate channels, each of which is extensively processed before being re-combined in order to recreate an improved version of the originally received RF signal. Nowhere does Lovinggod teach or suggest the suitability of its alleged digital summation technique in the application described in connection with FIG. 12 of Russell.

Furthermore, it is noted that it is simply not the case that one of ordinary skill in the art would have assumed that using digital RF transport to and from multiple remotes somehow always required the use of digital summation as recited in claim 1 of the present application. Indeed, the embodiments shown in FIGS. 39A-39B of Russell show alternatives in which each digitized RF signal received from each of multiple remotes is separately demodulated and the resulting demodulated digital voice/data from all of the multiple remotes are then processed by a selector/processor 880.

Claims 2-3, 5-13 depend from claim1. Therefore, at least the arguments set forth above with respect to claim 1 apply to these claims as well.

Claim 14 was apparently rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 15-16 and 18-24 depend from claim 14. Therefore, at least the arguments set forth with respect to claim 14 apply to these claims as well.

Claim 25 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 26-27 depend from claim 25. Therefore, at least the arguments set forth with respect to claim 25 apply to these claims as well.

Claim 28 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 29-32 depend from claim 28. Therefore, at least the arguments set forth with respect to claim 28 apply to these claims as well.

Claim 34 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claim 35 depends from claim 34. Therefore, at least the arguments set forth with respect to claim 34 apply to claim 35 as well.

Claim 36 was apparently rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well.

Applicant respectfully requests withdrawal of this rejection.

Claims 4 and 17 were rejected under 35 USC § 103(a) as being unpatentable over Russell (U.S. Patent No. 5,644,622) in view of Lovinggood et al. (U.S. Patent No. 6,697,603) and Cook (U.S. Patent No. 6,005,884) and further in view of Kallander et al. (U.S. Patent No. 5,603,080). Applicant respectfully traverses this rejection.

Claim 4 depends from claim 1. Accordingly, at least the arguments set forth above with respect to claim 1 apply to claim 4 as well. Claim 17 depends from claim 14. Accordingly, at least the arguments set forth above with respect to claim 14 apply to claim 17 as well.

Applicant respectfully requests withdrawal of this rejection.

Claim 33 was rejected under 35 USC § 103(a) as being unpatentable over Russell (U.S. Patent No. 5,644,622) in view of Lovinggood et al. (U.S. Patent No. 6,697,603) and Cook (U.S. Patent No. 6,005,884) and further in view of Dail (U.S. Patent No. 5,765,097). Applicant respectfully traverses this rejection.

Claim 33 was rejected using the same reasoning as was used in rejecting claim 28. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 28 apply to this claim as well.

Applicant respectfully requests withdrawal of this rejection.

CONCLUSION

Applicant respectfully submits that claims 1-36 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 2007-09-18

/Jon M. Powers/
Jon M. Powers
Reg. No. 43,868

Attorneys for Applicant
Fogg & Powers LLC
P.O. Box 581339
Minneapolis, MN 55458-1339
T – (612) 332-4720
F – (612) 332-4731

Electronic Acknowledgement Receipt

EFS ID:	2207868
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	18-SEP-2007
Filing Date:	19-DEC-2003
Time Stamp:	14:53:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		00103747.PDF	117976 5aa8bc44c6dab0166e0a04c151812bcc7a106f91	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment After Final	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	7
Warnings:			
Information:			
	Total Files Size (in bytes):	117976	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

34206 7590 07/18/2007

FOGG & POWERS LLC
10 SOUTH FIFTH STREET
SUITE 1000
MINNEAPOLIS, MN 55402

EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

MAIL DATE	DELIVERY MODE
07/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	Duc M. Nguyen	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to applicant's response filed on 6/25/07. Claims 1-36 are now pending in the present application. **This action is made final**.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims **1-2, 5, 7** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** (US **6,005,884**) in view of **Schmutz** et al (US **6,262,981**).

Regarding claim **1, Cook** discloses a digital radio frequency transport system, comprising:

a digital host unit 12c (see Fig 4 regarding base station 12c and col. 17, lines 23-37); and

at least two digital remote units (repeater 18b) coupled to the digital host unit (see Fig. 4), wherein the digital host unit includes shared circuitry (see Fig. 4, references 28a, 30b, 34a) that performs bi-directional simultaneous digital radio frequency distribution of digitized RF signals between the digital host unit and the at least two digital remote units, wherein the digital host unit digitally sums the digitized RF signal received at the digital host unit (see col. 9, line 65 – col. 10, line 8).

Here, although the cited paragraph (col. 9, line 65 – col. 10, line 8) relate to the signal processor 28 in Fig.3, one skilled in the art would recognize that the signal processor 28a in Fig. 4 would perform a similar function, namely a combining function, as of signal processor 28 mentioned in Fig. 3. Therefore, it is clear that **Cook** would obviously, if not implicitly, teach a digital adder/summer for combining the digital signals in the similar way as disclosed by **Schmutz** (see Figs. 2-3 and col. 6, lines 10-17, 44-59 regarding the combiner 280). Therefore, the claimed limitation regarding a digital summer/adder is made obvious by Cook and Schmutz.

Regarding claim **2, Cook** would disclose a wireless interface device coupled to the digital host unit as claimed (see Fig. 4 regarding ref. 34a).

Regarding claim **5, Cook** would disclose a main RF antenna as claimed (see Fig. 4, ref. 24).

Regarding claim **7, Cook** would teach a multiplexer for splitting the signal as claimed (see Fig. 4, ref. 28 and col. 9, line 65 – col. 10, line 8 and col. 5, lines 15-16).

3. Claims **14, 25, 28, 33, 34, 36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** in view of **Schmutz** and further in view of **Russell** et al (US **5,644,622**).

Regarding claims **14, 36,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Cook** to further provide a digital expansion unit as disclosed by **Russell** (see Figs. 12, 14 regarding ref.

270 and col. 15, lines 25-35) so that a single optical fiber can be used in place of a pair of optical fiber, for cost saving.

Regarding claims **25, 28, 33, 34,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. However, Cook fails to teach an RF analog signal protocol format for the communication interface 34 that converts digitized RF signal to another protocol format associated with the host computer 14 and vice versa (see col. 10, lines 8-48). However, in an analogous art, Russell teaches a base station wherein such signal protocol format is an RF analog signal (see Figs. 2-3 and 21A, 21B). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Russell's teaching to modify Cook to provide an MTSO in Cook, thereby providing an RF analog signal as another signal protocol format. By doing so, the communication interface 34 as modified would comprise ADC and DAC for the base station as well, in order to transport RF signals between remote terminals and the MTSO.

4. Claims **1-2, 5, 7** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** (US **6,005,884**) in view of **Lovinggood** et al (US **6,697,603**).

Regarding claim **1, Cook** discloses a digital radio frequency transport system, comprising:

a digital host unit 12c (see Fig 4 regarding base station 12c and col. 17, lines 23-37); and

at least two digital remote units (repeater 18b) coupled to the digital host unit (see Fig. 4), wherein the digital host unit includes shared circuitry (see Fig. 4, references 28a, 30b, 34a) that performs bi-directional simultaneous digital radio frequency distribution of digitized RF signals between the digital host unit and the at least two digital remote units, wherein the digital host unit digitally sums the digitized RF signal received at the digital host unit (see col. 9, line 65 – col. 10, line 8).

Here, although the cited paragraph (col. 9, line 65 – col. 10, line 8) relate to the signal processor 28 in Fig.3, one skilled in the art would recognize that the signal processor 28a in Fig. 4 would perform a similar function, namely a combining function, as of signal processor 28 detailed in Fig. 3. Therefore, it is clear that **Cook** would obviously, if not implicitly, teach a digital adder/summer for combining the digital signals in the similar way as disclosed by Lovinggood (see col. 5, lines 20-24). Therefore, the claimed limitation regarding a digital summer/adder is made obvious by Cook and Lovinggood.

Regarding claim **2, Cook** would disclose a wireless interface device coupled to the digital host unit as claimed (see Fig. 4 regarding ref. 34a).

Regarding claim **5, Cook** would disclose a main RF antenna as claimed (see Fig. 4, ref. 24).

Regarding claim **7, Cook** would teach a multiplexer for splitting the signal as claimed (see Fig. 4, ref. 28 and col. 9, line 65 – col. 10, line 8 and col. 5, lines 15-16).

5. Claims **14, 25, 28, 33, 34, 36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** in view of **Lovinggood** and further in view of **Russell** et al (US **5,644,622**).

Regarding claims **14, 36,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Cook** to further provide a digital expansion unit as disclosed by **Russell** (see Figs. 12, 14 regarding ref. 270 and col. 15, lines 25-35) so that a single optical fiber can be used in place of a pair of optical fiber, for cost saving.

Regarding claims **25, 28, 33, 34,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. However, Cook fails to teach an RF analog signal protocol format for the communication interface 34 that converts digitized RF signal to another protocol format associated with the host computer 14 and vice versa (see col. 10, lines 8-48). However, in an analogous art, Russell teaches a base station wherein such signal protocol format is an RF analog signal (see Figs. 2-3 and 21A, 21B). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Russell's teaching to modify Cook to provide an MTSO in Cook, thereby providing an RF analog signal as another signal protocol format. By doing so, the communication interface 34 as modified would comprise ADC and DAC for the base station as well, in order to transport RF signals between remote terminals and the MTSO.

6. Claims **1-3, 5-16, 18-32, 34-36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** et al (US **5,644,622**) in view of **Lovinggood** and **Cook**.

Regarding claim **1, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

However, **Russell** is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, or be modified to, be summed by a summing node, locate inside the digital transceiver unit 130 or before the analog (+) node in Fig. 13, in order to produce a single digital output signal in the similar way as disclosed by **Lovinggod** (see col. 5, lines 20-24) and **Cook** (see Fig. 4 regarding signal processor 28a and col. 9, line 65 – col. 10, line 8. See also col. 17, lines 23- 37 regarding digitized signals for the base station 12c) so that this single digital output signal could be converted to an analog signal with a single DAC converter. Therefore, it would have been obvious to

one of ordinary skill in the art at the time the invention was made to modify **Russell**, for digitally summing digitized RF signals from two DRT before converting to an analog signal for summing with an external RF analog signal in Fig. 13, for cost saving (i.e, only one D/A converter is required for converting these two digital signals).

Regarding claim **2, Russell** would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim **3, Russell** would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim **5, Russell** would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim **6, Russell** would disclose the digital host unit includes a radio 3frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **7,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly

disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed.

Regarding claim **8, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **9, Russell** would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim **10, Russell** would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim **11, Russell** would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the "digital expansion unit" as claimed (see col. 15, lines 25-36).

Regarding claim **12, Russell** would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim **14,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above.

Regarding claim **15,** the claim is interpreted and rejected for the same reason as set forth in claim **2** above.

Regarding claim **16,** the claim is interpreted and rejected for the same reason as set forth in claim **3** above.

Regarding claim **18, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim **19, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim **20,** the claim is interpreted and rejected for the same reason as set forth in claim **12** above.

Regarding claim **22, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **23,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim **24, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **28,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting the radio frequency signals to a digitized radio frequency spectrum (see Fig. 4 regarding broadband digitizer 132);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see Fig. 8 regarding D/A 164); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim **30,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the radio frequency signal to a digitized radio frequency sprectrum comprises synchronizing a forward path local

oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim **34,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **35,** the claim is interpreted and rejected for the same reason as set forth in claim **10** above regarding the "alarm/control interface".

Regarding claim **36,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above regarding the "digital expansion unit".

Regarding claim **13,** although **Russell** would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim **21,** the claim is interpreted and rejected for the same reason as set forth in claim **13** above.

Regarding claim **25,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the "wireless interface device").

Regarding claim **26,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for

amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim **27,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **29, 31,** the claims are rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier during A/D and/or D/A conversions as claimed, for improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim **32,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation

(see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

7. Claims **4, 17,** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Lovinggood** and **Cook** and further in view of **Kallander et al** (US Patent Number **5,603,080**).

Regarding claim **4,** it is rejected for the same reason as set forth in claim **2** above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, **Russell** fails to disclose a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that **Russell** also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed by **Kallander** (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by **Kallander** (see col. 4, lines 54-67) to compensate for propagation loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim **17,** the claim is interpreted and rejected for the same reason as set forth in claim **4** above.

8. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Lovinggood**, **Cook** and further in view of **Dail** (US Patent Number **5,765,097**).

Regarding claim **33,** the claim is interpreted and rejected for the same reason as set forth in claim **28** above. However, Russell fails to disclose a digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by **Dail** (see Fig. 2, ref. 220 and col. 4, line 28 – col. 5, line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Dail's teaching to Russell, for providing a digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Response to Arguments

9. Applicant's arguments with respect to claims 1-36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

See the attached PTO-892.

12. **Any response to this final action should be mailed to:**

Box A.F.

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Matthew Anderson (Supervisor) whose telephone number is (571) 272-4177.

Duc M. Nguyen, P.E.

July 9, 2007

Notice of References Cited	Application/Control No. 10/740,944	Applicant(s)/Patent Under Reexamination WALA, PHILIP M.	
	Examiner Duc M. Nguyen	Art Unit 2618	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,697,603	02-2004	Lovinggood et al.	455/13.1
*	B	US-6,262,981	07-2001	Schmutz, Thomas R.	370/347
*	C	US-6,480,551	11-2002	Ohishi et al.	375/260
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/740,944	WALA, PHILIP M.
Examiner	**Art Unit**
Duc M. Nguyen	2618

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date
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Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
10/740,944	WALA, PHILIP M.	
Examiner	**Art Unit**	
Duc M. Nguyen	2618	

SEARCHED

Class	Subclass	Date	Examiner
455	7 14->22	8/10/2006	DN
	553 561		
	3.01 3.05		
370	906		
	907		
	466 501		
	535->537	8/10/2006	DN
updated		1/25/07	BW

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)

	DATE	EXMR
EAST	8/10/2006	DN
EAST	8/17/2006	DN
EAST	1/25/07	BW
EAST	4/24/07	BW
EAST	7/9/07	BW

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	22462	(digital$6 near2 (sum summing add$3))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/07/09 13:38
L2	1243	1 and "455"/	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/07/09 13:38
L3	605	2 and "375"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/07/09 13:38
L4	605	2 and "375"/	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/07/09 13:39
L5	254	4 and "370"/	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/07/09 15:09
L6	2	"6697603".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/07/09 15:09
L7	6	("5535240" | "6118810" | "6167099" | "6253060" | "6370185" | "6389078"). PN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/07/09 16:14

Applicant(s)	Wala	**AMENDMENT AND RESPONSE UNDER 37 C.F.R. § 1.116 EXPEDITED EXAMINATION PROCEDURE**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Group Art Unit	2618	
Examiner Name	Nguyen, Duc M.	
Confirmation No.	3898	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Final Office Action mailed on April 25, 2007 has been reviewed.

Remarks begin on page 2 of this paper.

REMARKS

The Final Office Action mailed on April 25, 2007 has been reviewed. Claims 1-36 are pending in this application.

Rejections Under 35 U.S.C. § 102

Claims 1-2, 5, and 7 were rejected under 35 USC § 102(a) as being anticipated by Cook (U.S. Patent No. 6,005,884). Applicant respectfully traverses this rejection.

The Office Action generally relies on the system shown in FIG. 4 of Cook in rejecting claim 1. However, in connection with the language "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit" recited in claim 1 of the present application, the Office Action cites a portion of Cook describing a signal processor 28 that is used in a different embodiment. Specifically, the Office Action cites col. 9, line 65 - col. 10, line 8 of Cook, which is clearly describing signal processor 28 as used in an analog embodiment (not signal processor 28a of FIG. 4). This cited portion of Cook (col. 9, line 65 - col. 10, line 8) is describing an embodiment where a conventional analog radio transceiver 30a is used. As a consequence, the signal processor 28 (not signal processor 28a) acts as a conventional analog RF splitter/combiner. On the other hand when dealing with FIG. 4, nowhere does Cook teach or suggest that signal processor 28b of FIG. 4 "digitally sums" "digitized radio frequency signals." Moreover, the cited portion of Cook (col. 9, line 65 - col. 10, line 8) should not be applied to the embodiment of FIG. 4 since Cook shows that a different type of transceiver 30b is being used in that embodiment (namely, a digital transceiver 30b that is implemented using digital signal processor modules instead of an analog radio transceiver 30a). Cook, in relevant part, describes the operation of the embodiment shown in FIG. 4 at col. 18, line 37 – col. 19, line 3 and clearly indicates that no digital summation as recited in claim 1 of the present application occurs.

Claims 2, 5 and 7 all depend from claim 1.

Applicant respectfully requests withdrawal of this rejection.

Rejections Under 35 U.S.C. § 103

Claims 14, 25, 28, 33, 34, and 36 were rejected under 35 USC § 103(a) as being unpatentable over Cook (U.S. Patent No. 6,005,884) in view of Russell et al. (U.S. Patent No. 5,644,622). Applicant respectfully traverses this rejection.

The Office Action applied the same reasoning used to reject claim 1 to this rejection. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this rejection as well. Applicant respectfully requests withdrawal of this rejection.

Claims 1-3, 5-16, 18-32, and 34-36 were rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Cook (U.S. Patent No. 6,005,884). Applicant respectfully traverses this rejection.

In connection with claim 1 of the present application, the Office Action cited FIGS. 12 and 13 of Russell. The Office Action conceded that Russell is silent on digitally summing digitized RF signals at the host unit but noted "that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, if not implicitly, be summed by a summing node in order to produce a single digital output signal in the similar way as disclosed by Cook (see Fig. 4 regarding signal processor 28a and col. 9, line 65 - col. 10, line 8. See also col. 17, lines 23- 37 regarding digitized signals for the base station 12c)." The Office Action concluded that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for digitally summing digitized RF signals from two DRTs before converting to an analog signal, for cost saving (i.e, only one DIA converter is required for converting these two digital signals)."

As noted above, the cited portion of Cook does not relate to digitally summing as recited in claim 1. Thus, it is respectfully submitted, that one of ordinary skill in the art would not modify Russell as proposed in the Office Action based on the cited portion of Cook. Moreover, it is respectfully submitted that one of ordinary skill in the art, when presented with the teachings of Russell would implement what is actually taught in Russell in connection with FIGS. 12 and 13 – that is, the use of an analog combiner (please note the MAIN ANTENNA shown in FIG. 13). Furthermore, it is noted that it is simply not the case that one of ordinary skill in the art would have assumed that using digital RF transport to and from multiple remotes somehow always required the use of digital summation as recited in claim 1 of the present application. Indeed, the embodiments shown in FIGS. 39A-39B of Russell show alternatives in which each digitized RF signal received from each of multiple remotes is separately demodulated and the resulting demodulated digital voice/data from all of the multiple remotes are then processed by a selector/processor 880.

Claims 2-3, 5-13 depend from claim1. Therefore, at least the arguments set forth above with respect to claim 1 apply to these claims as well.

Claim 14 was apparently rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 15-16 and 18-24 depend from claim 14. Therefore, at least the arguments set forth with respect to claim 14 apply to these claims as well.

Claim 25 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 26-27 depend from claim 25. Therefore, at least the arguments set forth with respect to claim 25 apply to these claims as well.

Claim 28 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claims 29-32 depend from

claim 28. Therefore, at least the arguments set forth with respect to claim 28 apply to these claims as well.

Claim 34 was rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well. Moreover, claim 35 depends from claim 34. Therefore, at least the arguments set forth with respect to claim 34 apply to claim 35 as well.

Claim 36 was apparently rejected using the same reasoning as was used in rejecting claim 1. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to this claim as well.

Applicant respectfully requests withdrawal of this rejection.

Claims 4 and 17 were rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Cook (U.S. Patent No. 6,005,884) an further in view of Kallander et al. (U.S. Patent No. 5,603,080). Applicant respectfully traverses this rejection.

Claim 4 depends from claim 1. Accordingly, at least the arguments set forth above with respect to claim 1 apply to claim 4 as well. Claim 17 depends from claim 14. Accordingly, at least the arguments set forth above with respect to claim 14 apply to claim 17 as well.

Applicant respectfully requests withdrawal of this rejection.

Claim 33 was rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Cook (U.S. Patent No. 6,005,884) an further in view of Dail (U.S. Patent No. 5,765,097). Applicant respectfully traverses this rejection.

Claim 33 was rejected using the same reasoning as was used in rejecting claim 28. Accordingly, it is respectfully submitted that at least the arguments set forth above with respect to claim 28 apply to this claim as well.

Applicant respectfully requests withdrawal of this rejection.

CONCLUSION

Applicant respectfully submits that claims 1-36 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 2007-06-25

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Electronic Acknowledgement Receipt

EFS ID:	1906856
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
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Application Type:	Utility

Payment information:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part /.zip	Pages (if appl.)
1		00097143.pdf	103199	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment After Final	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	7
Warnings:			
Information:			
	Total Files Size (in bytes):	103199	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

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EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/25/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	Duc M. Nguyen	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 4/5/07.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-36 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-36 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to applicant's response filed on 4/5/07. Claims 1-36 are now pending in the present application. **This action is made final**.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims **1-2, 5, 7** are rejected under 35 U.S.C. 102(a) as being anticipated by **Cook** (US **6,005,884**).

Regarding claim **1, Cook** discloses a digital radio frequency transport system, comprising:

a digital host unit 12c (see Fig 4 regarding base station 12c and col. 17, lines 23-37); and

at least two digital remote units (repeater 18b) coupled to the digital host unit (see Fig. 4), wherein the digital host unit includes shared circuitry (see Fig. 4, references 28a, 30b, 34a) that performs bi-directional simultaneous digital radio frequency distribution of digitized RF signals between the digital host unit and the at least two digital remote units, wherein the digital host unit digitally sums the digitized RF signal received at the digital host unit (see col. 9, line 65 – col. 10, line 8).

Regarding claim **2, Cook** would disclose a wireless interface device coupled to the digital host unit as claimed (see Fig. 4 regarding ref. 34a).

Regarding claim **5, Cook** would disclose a main RF antenna as claimed (see Fig. 4, regarding ref. 24).

Regarding claim **7, Cook** would teach a multiplexer for splitting the signal as claimed (see Fig. 4, regarding ref. 28 and col. 9, line 65 – col. 10, line 8 and col. 5, lines 15-16).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims **14, 25, 28, 33, 34, 36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Cook** in view of **Russell** et al (US **5,644,622**).

Regarding claims **14, 36,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Cook** to further provide a digital expension unit as disclosed by **Russell** (see Figs. 12, 14 regarding ref. 270 and col. 15, lines 25-35) so that a single optical fiber can be used in place of a pair of optical fiber, for cost saving.

Regarding claims **25, 28, 33, 34,** the claims are interpreted and rejected for the same reason as set forth in claim **1** above. However, Cook does not explicitly teach an RF analog signal protocol format for the communication interface 34 that converts digitized RF signal to another protocol format associated with the host computer 14 and vice versa (see col. 10, lines 8-48). However, in an analogous art, Russell teaches a digital host unit (base station 106) wherein Russell teaches such signal protocol format is an RF analog signal (see Figs. 2-3, 14 and 21A, 21B). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Russell's teaching to modify Cook to further provide an MTSO connecting to the base station in Cook, thereby providing an RF analog signal as another signal protocol format. By doing so, the communication interface 34 as modified would comprise ADC and DAC for the base station as well, in order to transport RF signals between remote terminals and the MTSO.

5. Claims **1-3, 5-16, 18-32, 34-36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** et al (US **5,644,622**) in view of **Cook** (US **6,005,884**).

Regarding claim **1, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency

distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

However, **Russell** is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, if not implicitly, be summed by a summing node in order to produce a single digital output signal in the similar way as disclosed by **Cook** (see Fig. 4 regarding signal processor 28a and col. 9, line 65 – col. 10, line 8. See also col. 17, lines 23- 37 regarding digitized signals for the base station 12c). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell**, for digitally summing digitized RF signals from two DRTs before converting to an analog signal, for cost saving (i.e, only one D/A converter is required for converting these two digital signals).

Regarding claim **2, Russell** would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim **3, Russell** would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim **5, Russell** would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim **6, Russell** would disclose the digital host unit includes a radio 3frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **7,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed.

Regarding claim **8, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **9, Russell** would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim **10, Russell** would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim **11, Russell** would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the "digital expansion unit" as claimed (see col. 15, lines 25-36).

Regarding claim **12, Russell** would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim **14,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above.

Regarding claim **15,** the claim is interpreted and rejected for the same reason as set forth in claim **2** above.

Regarding claim **16,** the claim is interpreted and rejected for the same reason as set forth in claim **3** above.

Regarding claim **18, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim **19, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim **20,** the claim is interpreted and rejected for the same reason as set forth in claim **12** above.

Regarding claim **22, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **23,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim **24, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **28,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting the radio frequency signals to a digitized radio frequency spectrum (see Fig. 4 regarding broadband digitizer 132);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see Fig. 8 regarding D/A 164); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim **30,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the radio frequency signal to a digitized radio frequency sprectrum comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim **34,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **35,** the claim is interpreted and rejected for the same reason as set forth in claim **10** above regarding the "alarm/control interface".

Regarding claim **36,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above regarding the "digital expansion unit".

Regarding claim **13,** although **Russell** would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim **21,** the claim is interpreted and rejected for the same reason as set forth in claim **13** above.

Regarding claim **25,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the "wireless interface device").

Regarding claim **26,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim **27,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, **Russell** discloses converting the digitized radio frequency

spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **29, 31,** the claims are rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier during A/D and/or D/A conversions as claimed, for improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim **32,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

6. Claims **4, 17,** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Cook** and further in view of **Kallander et al** (US Patent Number **5,603,080**).

Regarding claim **4,** it is rejected for the same reason as set forth in claim **2** above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, **Russell** fails to disclose a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that **Russell** also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed by **Kallander** (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by **Kallander** (see col. 4, lines 54-67) to compensate for propagation loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim **17,** the claim is interpreted and rejected for the same reason as set forth in claim **4** above.

7. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Cook** and further in view of **Dail** (US Patent Number **5,765,097**).

Regarding claim **33,** the claim is interpreted and rejected for the same reason as set forth in claim **28** above. However, Russell fails to disclose a digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by **Dail** (see Fig. 2, ref. 220 and col. 4, line 28 – col. 5, line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Dail's teaching to Russell, for providing a digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Response to Arguments

8. Applicant's arguments with respect to claims 1-36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

See the attached PTO-892.

11. **Any response to this final action should be mailed to:**

Box A.F.

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Matthew Anderson (Supervisor) whose telephone number is (571) 272-4177.

Duc M. Nguyen, P.E.

Apr 24, 2007

Notice of References Cited	Application/Control No. 10/740,944	Applicant(s)/Patent Under Reexamination WALA, PHILIP M.	
	Examiner Duc M. Nguyen	Art Unit 2618	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,466,572 B1	10-2002	Ethridge et al.	370/352
*	B	US-6,801,767 B1	10-2004	Schwartz et al.	455/426.2
*	C	US-7,035,671 B2	04-2006	Solum, Jeffrey	455/562.1
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/740,944	WALA, PHILIP M.
Examiner	**Art Unit**
Duc M. Nguyen	2618

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

| Claim | | Date | | | | | | |

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
10/740,944	WALA, PHILIP M.	
Examiner	**Art Unit**	
Duc M. Nguyen	2618	

SEARCHED			
Class	Subclass	Date	Examiner
455	7 14->22	8/10/2006	DN
	553 561		
	3.01 3.05		
370	906		
	907		
	498 501		
	535->537	8/10/2006	DN
updated		1/25/07	DN

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST	8/10/2006	DN
EAST	8/17/2006	DN
EAST	1/25/07	DN
EAST	4/24/07	DN

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	605	(digital near2 (host hub)) and (digital$6 near3 (sum summing combin$6))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:20
L2	57	L1 and (digital near3 (remote repeater expansion))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:20
L3	4	"6771933".pn. "6785558".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:21
L4	16	("20020055371" | "20020187809" | "20030040337" | "20030114103" | "20030162539" | "5627879" | "5852651" | "6023625" | "6112086" | "6374124" | "6522641" | "6674966"). PN. OR ("6785558").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/04/24 11:21
L5	8	("20020075844").PN. OR ("6771933"). URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/04/24 11:21
L6	35	("20020009982" | "20020061024" | "20020114303" | "20020197984" | "20030012174" | "20030063593" | "20030133422" | "20030137959" | "20030181221" | "4789983" | "5280472" | "5570352" | "5842117" | "5864265" | "5912921" | "5923702" | "5960344" | "6047175" | "6192026" | "6196456" | "6259898" | "6381458" | "6393261" | "6463303" | "6529164" | "6560443" | "6560448" | "6580704" | "6590884" | "6671284" | "6674403" | "6741643" | "6771933" | "6785558" | "6801767").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/04/24 11:21
L7	2	"6704545".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:44

EAST Search History

L8	20	("4760573" | "5603080" | "5621786" | "5627879" | "5642405" | "5644622" | "5657374" | "5765097" | "5765099" | "5774789" | "5852651" | "5878325" | "5946622" | "5969837" | "6112086" | "6147786" | "6198558" | "6362908" | "6486907").PN. OR ("6704545").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/04/24 11:21
L9	77	L3 L4 L5 L6 L7 L8	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:21
L10	16	L9 and (digital$6 near3 (sum summing combin$6))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:25
L11	5	(digital and host and remote and sum and (transport$5 distribut$7)).clm.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:28
L12	19	("4760573" | "5603080" | "5621786" | "5627879" | "5642405" | "5644622" | "5657374" | "5765097" | "5765099" | "5774789" | "5852651" | "5878325" | "5946622" | "5969837" | "6112086" | "6147786" | "6198558" | "6362908" | "6486907").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/04/24 11:34
L13	2	"6275990".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:44
L14	1	13 and sum$7	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:36
L15	0	13 and (digit$5 near9 sum$7)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:52
L16	2	"6005884".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:44

EAST Search History

L17	0	16 and (digit$5 near9 (sum$7 combin$6))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 11:54
L18	1	16 and ((sum$7 combin$6))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 12:35
L19	1	16 and (optic$6 fiber$6)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/24 12:35

Applicant(s)	Wala	**RESPONSE UNDER 37 C.F.R. § 1.116 EXPEDITED EXAMINATION PROCEDURE**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Group Art Unit	2618	
Examiner Name	Nguyen, Duc M.	
Confirmation No.	3898	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Final Office Action mailed on February 5, 2007 has been reviewed. Please amend the above-identified application as follows.

Remarks begin on page 2 of this paper.

REMARKS

The Final Office Action mailed on February 5, 2007 has been reviewed. Claims 1-36 are pending in this application. Applicant respectfully requests reconsideration and withdrawal of the outstanding claim rejections.

Rejections Under 35 U.S.C. § 103

Claims 1-3, 5-16, 18-32, 34-36 were rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. 5,644,622) in view of Wala (U.S. Patent No. 6,112,086).

Statement Concerning Common Ownership under 35 U.S.C. 103(c)

It is respectfully submitted that the Wala patent should be disqualified as prior art for purposes of 35 U.S.C. 103(a) under 35 U.S.C. 103(c). Section 103(c) states:

> Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

The present application and the Wala patent were, at the time the invention of the present application was made, owned by ADC Telecommunications, Inc. Therefore, the Wala patent should be precluded from consideration as prior art under Section 103(a) under Section 103(c). *See, e.g.,* MPEP 706.02(l)(2).

Furthermore, as was noted in the Applicant's response to the previous Office Action, the summing node shown in Fig. 13 in the uplink direction is summing an analog RF signal that is output by the digital/optical transceiver unit 130 with an analog RF signal received by the main cell antenna; there is no teaching or suggestion that this

summing is digital given that both signals are analog. *See, e.g.,* Russell, col. 10, lines 26-32 ("Unit 130 also receives a digitized RF signal over fiber 104B from a remote antenna unit 102, reconstructs the corresponding analog RF signal, and applies it to receivers 28. Accordingly, conventional equipment may be used on the downstream (MTSO) side of digital transmitting/receiving unit 130."). Moreover, with regard to Figure 12 of Russell, the two remote antenna units are coupled to the same base station unit 106' using separate fiber optic pairs. These two fiber optic pairs would be terminated in the base station unit 106' using separate digital transceiver units 130 (only one of which is shown in Figure 13 – only one fiber optic pair is shown in Figure 13), each of which would output a separate analog RF signal that is summed in an analog manner along with the analog RF signal from the main antenna 250 by the summing node shown in Figure 13. Thus, any teaching or suggestion in Figures 12 and 13 of Russell regarding the summing of upstream RF signals received from multiple remote units 102 would relate to analog summation.

Accordingly, it is respectfully requested that this rejection of claim 1 be withdrawn.

Claims 2-3 and 5-13 depend from claim 1. Consequently, it is respectfully requested that this rejection of these claims be withdrawn for at least the reasons set forth above with respect to claim 1.

Moreover, it is respectfully submitted that at least the argument set forth above apply to the other rejected claims 14-16, 18-32, and 34-36 as well. Accordingly, it is respectfully requested that the rejection of these claims be withdrawn.

Claims 4 and 17 were rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. '622) in view of Kallander et al. (U.S. Patent No. 5,603,080).

The Office Action indicates that the rejection of claims 4 and 17 relied on the rationale that was used in the Office Action to reject claim 2. Also, claim 4 ultimately depends from claim 1, and claim 17 ultimately depends from 14. Therefore, it is respectfully submitted that at least the arguments set forth above apply to these claims 4 and 17. Accordingly, it is respectfully requested that this rejection of claims 4 and 17 be withdrawn.

Claim 33 was rejected under 35 USC § 103(a) as being unpatentable over Russell et al. (U.S. Patent No. '622) in view of Dail (U.S. Patent No. 5,765,097).

The Office Action indicates that the rejection of claim 33 relied on the rationale that was used in the Office Action to reject claim 28. Also, claim 33 ultimately depends from claim 28. Therefore, it is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to claim 33. Accordingly, it is respectfully requested that this rejection of claim 28 be withdrawn.

CONCLUSION

Applicant respectfully submits that claims 1-36 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 2007-04-05

/Jon M. Powers/
Jon M. Powers
Reg. No. 43,868

Attorneys for Applicant
Fogg & Powers LLC
P.O. Box 581339
Minneapolis, MN 55458-1339
T – (612) 332-4720
F – (612) 332-4731

Electronic Acknowledgement Receipt

EFS ID:	1656395
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	05-APR-2007
Filing Date:	19-DEC-2003
Time Stamp:	13:57:33
Application Type:	Utility

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part /.zip	Pages (if appl.)
1		00092267.pdf	103417	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment After Final	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	5
Warnings:			
Information:			
	Total Files Size (in bytes):	103417	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

34206 7590 02/05/2007
FOGG & POWERS LLC
10 SOUTH FIFTH STREET
SUITE 1000
MINNEAPOLIS, MN 55402

EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/05/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	Duc M. Nguyen	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to applicant's response filed on 10/12/04. Claims 1-6 are now pending in the present application. **This action is made final.**

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims **1-3, 5-16, 18-32, 34-36** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** et al (US **5,644,622**) in view of **Wala** (US **6,112,086**).

Regarding claim **1, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

However, **Russell** is silent on digitally summing digitized RF signals at the host unit. However, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from a DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 (see Fig. 12) would obviously, if not implicitly, be summed by a summing node in order to produce a single analog output signal for summing with another external analog signal as shown in Fig. 13 of **Russell** (see the summing node +). Since digitally summing digitized RF signals is known in the art as disclosed by **Wala** (see Fig. 8A, host 406 and Fig. 8B, sum node 840), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell**, for digitally summing digitized RF signals before converting to a wideband analog signal as taught by Wala, for cost saving (i.e, only one D/A converter is required for converting these two digital signals).

Regarding claim **2, Russell** would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim **3, Russell** would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim **5, Russell** would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim **6, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **7,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed.

Regarding claim **8, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **9, Russell** would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim **10, Russell** would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim **11, Russell** would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the "digital expansion unit" as claimed (see col. 15, lines 25-36).

Regarding claim **12, Russell** would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim **14,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above.

Regarding claim **15,** the claim is interpreted and rejected for the same reason as set forth in claim **2** above.

Regarding claim **16,** the claim is interpreted and rejected for the same reason as set forth in claim **3** above.

Regarding claim **18, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim **19, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim **20,** the claim is interpreted and rejected for the same reason as set forth in claim **12** above.

Regarding claim **22, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **23,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim **24, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **28,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting the radio frequency signals to a digitized radio frequency spectrum (see Fig. 4 regarding broadband digitizer 132);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see.Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see Fig. 8 regarding D/A 164); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim **30,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the radio frequency signal to a digitized radio frequency sprectrum comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim **34,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **35,** the claim is interpreted and rejected for the same reason as set forth in claim **10** above regarding the "alarm/control interface".

Regarding claim **36,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above regarding the "digital expansion unit".

Regarding claim **13,** although **Russell** would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim **21,** the claim is interpreted and rejected for the same reason as set forth in claim **13** above.

Regarding claim **25,** the claim is rejected for the same reason as set forth in claim **1** above regarding the digital summing. In addition, **Russell** discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the "wireless interface device").

Regarding claim **26,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim **27,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33,

line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **29, 31,** the claims are rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier during A/D and/or D/A conversions as claimed, for improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim **32,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

3. Claims **4, 17,** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Kallander et al** (US Patent Number **5,603,080**).

Regarding claim **4,** it is rejected for the same reason as set forth in claim **2** above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, **Russell** fails to disclose a base station that wirelessly connects to the

digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that **Russell** also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed by **Kallander** (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by **Kallander** (see col. 4, lines 54-67) to compensate for propagation loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim **17,** the claim is interpreted and rejected for the same reason as set forth in claim **4** above.

4. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Dail** (US Patent Number **5,765,097**).

Regarding claim **33,** the claim is interpreted and rejected for the same reason as set forth in claim **28** above. However, Russell fails to disclose a digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a digital repeater for amplifying or extending coverage area of an RF distribution system is well known in the art as disclosed by **Dail** (see Fig. 2, ref. 220 and col. 4, line 28 – col. 5, line 8). Therefore, it would have been obvious to one of ordinary

skill in the art at the time the invention was made to incorporate Dail's teaching to Russell, for providing a digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system while reducing the amount of aggregated ingressive noise.

Response to Arguments

5. Applicant's arguments with respect to claims 1-36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

See the attached PTO-892.

8. **Any response to this final action should be mailed to:**

Box A.F.

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Matthew Anderson (Supervisor) whose telephone number is (571) 272-4177.

Duc M. Nguyen, P.E.

Jan 28, 2007

Notice of References Cited	Application/Control No. 10/740,944	Applicant(s)/Patent Under Reexamination WALA, PHILIP M.	
	Examiner Duc M. Nguyen	Art Unit 2618	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,112,086 A	08-2000	Wala, Philip M.	455/434
*	B	US-5,765,097	06-1998	Dail, James E.	725/125
*	C	US-5,878,325 A	03-1999	Dail, James E.	725/125
*	D	US-6,374,124 B1	04-2002	Slabinski, Richard P.	455/562.1
*	E	US-6,771,933 B1	08-2004	Eng et al.	455/41.2
*	F	US-6,785,558 B1	08-2004	Stratford et al.	455/561
*	G	US-6,192,216 B1	02-2001	Sabat et al.	455/507
	H	US-			
	I	US-			
	J	US-			
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination
10/740,944	WALA, PHILIP M.
Examiner	**Art Unit**
Duc M. Nguyen	2618

SEARCHED			
Class	Subclass	Date	Examiner
455	7 14->22	8/10/2006	DN
	553 561		
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370	906		
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	498 501		
	535->537	8/10/2006	DN
updated		1/25/07	DN

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST	8/10/2006	DN
EAST	8/17/2006	DN
EAST	1/25/07	DN

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/740,944	WALA, PHILIP M.
Examiner	**Art Unit**
Duc M. Nguyen	2618

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
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Claim		Date									
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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"6771933".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 14:54
L2	1	("20020075844").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/01/25 15:01
L3	13	09/619431	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:06
L4	2	"6374124".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:07
L5	51	("4144411" | "4392245" | "4882765" | "4914715" | "5067173" | "5129098" | "5193223" | "5303287" | "5321736" | "5327144" | "5343493" | "5381459" | "5396484" | "5416802" | "5452473" | "5513176" | "5515014" | "5590173" | "5732353" | "5768279" | "5774808" | "5781541" | "5781859" | "5802173" | "5805983" | "5809395" | "5822324" | "5825762" | "5831976" | "6122529" | "6192216" | "6223021").PN. OR ("6374124").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/01/25 15:20
L6	53	4 5	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:20
L7	1	6 and (digital near2 remote$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:28
L8	0	6 and (digital near2 host$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:21

EAST Search History

L9	10	("5339184" | "5648961" | "5982327" | "6336042" | "6337754" | "6362906" | "6374124" | "6385441" | "6556325" | "6708020").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/01/25 15:28
L10	3	6 and (broad near2 band)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:31
L11	16	(digital near2 (RF radio) near2 transport$6).ti,ab.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:32
L12	27	(digital near2 (RF radio) near2 distribut$6).ti,ab.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:32
L13	40	11 12	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/01/25 15:32

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Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/740,944	WALA, PHILIP M.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed : November 21, 2006	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
Henry D. Jefferson

U.S. Patent and Trademark Office

T.D. INFORMAL MEMO: DO NOT MAIL THIS MEMO TO APPLICANT

Date:	04-Dec-06	APPL. S. N:	10740944
To Examiner:	NGUYEN, DUC	Art Unit	2618
From	Jefferson, Henry PARALEGAL SPCECIALIST	Return This Memo To: Case Drop-Off Location	JEF-2D68

SUBJECT: Decision on Terminal Disclaimer(T.D.) filed:

INSTRUCTIONS: I have reviewed the submitted T.D. with the results as set forth below. If you agree, please use the appropriate form paragraphs identified by this informal memo in your next Office action to notify applicant of the T.D. If you disagree or have any questions, please see me or the Special Program Examiner. THIS IS AN INFORMAL, INTERNAL MEMO ONLY. IT MUST NOT BE (1) MAILED TO APPLICANT OR (2) PLACED OF RECORD IN THE APPLICATION FILE. When your action is complete,

please initial, date and return this memo to me. THANK YOU.

☑ The T.D. is PROPER and has been recorded (see 14.23).

☐ The T.D. is NOT PROPER and has not been accepted for the reason(s) checked below (see 14.24):

- ☐ The TD fee of [ ] has not been submitted nor is there any authorization in the application file for the use of a deposit account
- ☐ The T.D. does not satisfy Rule 321 in that the person who has signed the T.D. has not stated the extent of his/her interest (and/or the extent of the interest of the business entity represented by the signature) in the application/patent (see 14.26 & 14.26.01).
- ☐ The T.D. lacks the enforceable only during common ownership clause – needed to overcome a non-statutory double patenting rejection, Rule 321(b) (see 14.27.01).
- ☐ The T.D. is directed to a particular claim(s), which is not acceptable since "the disclaimer must be for a terminal portion of the term of the entire patent to be granted" (MPEP 1490) (see 14.26 & 14.26.02).
- ☐ The person who signed the T.D.:
  - ☐ is not an attorney "of record" (see 14.29 and 14.29.01).
  - ☐ has failed to state his/her capacity to sign for the business entity (see 14.28).
  - ☐ is not recognized as an officer of the assignee (see 14.29 & possible 14.29.02).
- ☐ No documentary evidence of a chain of title from the original inventor(s) to assignee has been submitted, nor is the reel and frame number specified as to where such evidence is recorded in the Office (see 37 CFR 3.73(b) and 1140 O.G. 72). NOTE: This documentary evidence or the specifying of the reel and frame number may be found in the T.D. or in a separate paper of record in the application (see 14.30).
- ☐ The T.D. is not signed (see 14.26 & 14.26.03).
- ☐ The serial number of the application (or the number of the patent) which forms the basis for the double patenting rejection is missing or incorrect (see 14.32).
- ☐ The serial number of this application (or the number of the patent in reexam or reissue cases being disclaimed is missing or incorrect (see 14.26, 14.27.02 or 14.26.05).
- ☐ The period disclaimed is incorrect or not specified (see 14.26, 14.27.02 or 14.26.03).
- ☐ Other: [ ]
- ☐ Suggestion to request refund (see 14.36). NOTE: If already authorized, credit refund to deposit account and do not check this item.

I have appropriately notified applicant(s) of the status of the Terminal Disclaimer filed in this case.

Ex.Initials:_____ Date:_____ Log Date:

Applicant	Wala	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER PRIOR ART PATENT**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Group Art Unit	2618	
Confirmation No.	3898	
Examiner Name	Nguyen, Duc M.	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Owner, ADC Telecommunications, Inc., with a business address of 13625 Technology Drive, Eden Prairie, MN 55344-2252, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. §§ 154 to 156 and 173, as presently shortened by any terminal disclaimer, of U.S. Patent 6,704,545. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior respective patents are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors, or assigns.

In making the above disclaimer, the Owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. §§ 154 to 156 and 173 of any of the prior patents, as presently shortened by any terminal disclaimer, in the event that they later: expire for failure to pay a maintenance fee, are held unenforceable, are found invalid by a court of competent jurisdiction, are statutorily disclaimed in whole or terminally disclaimed under 37 CFR § 1.321, have all claims canceled by a reexamination certificate, are reissued, or are in any manner terminated prior to the expiration of their full statutory term as presently shortened by any terminal disclaimer.

Authorization to a Credit Card for payment of the Terminal Disclaimer fee of $130.00 pursuant to 37 C.F.R. § 1.20(d) is provided herewith. Please charge any further fees deemed necessary or credit any overpayment to Deposit Account No. 502432.

The undersigned attorney is authorized to act on behalf of the assignee.

The Examiner is invited to contact the below-signed attorney if any further assistance is required.

Respectfully submitted,

Date: 11-21-2006

Jon M. Powers
Reg. No. 43,868

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PATENT APPLICATION FEE DETERMINATION RECORD
Effective December 8, 2004

10-740944

AMENDMENT 11/21/06	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 36	Minus	** 36	= —
Independent	* 9	Minus	*** 7	= —
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=		OR	X$50=	
X100=		OR	X200=	
+180=		OR	+360=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=		OR	X$50=	
X100=		OR	X200=	
+180=		OR	+360=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=		OR	X$50=	
X100=		OR	X200=	
+180=		OR	+360=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=		OR	X$50=	
X100=		OR	X200=	
+180=		OR	+360=	

Applicant(s)	Wala	**AMENDMENT AND RESPONSE UNDER 37 C.F.R. § 1.111**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Confirmation No.	3898	
Examiner Name	Nguyen, Duc M.	
Group Art Unit	2618	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Applicants have reviewed the Office Action mailed on August 24, 2006. Please amend the above-identified application as follows.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 10 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of claims:

1. (Currently Amended) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

2. (Original) The system of claim 1, further comprising a wireless interface device coupled to the digital host unit.

3. (Original) The system of claim 2, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

4. (Currently Amended) The system of claim 2, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier ~~that is coupled to an antenna~~.

5. (Original) The system of claim 1, wherein the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals.

6. (Currently Amended) The system of claim 1, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the [a] digitized radio frequency signals. ~~signal.~~

7. (Currently Amended) The system of claim 6, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

8. (Original) The system of claim 1, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

9. (Original) The system of claim 1, wherein the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair.

10. (Original) The system of claim 7, wherein the digital host unit further comprises an alarm/control interface circuit coupled to the multiplexer.

11. (Original) The system of claim 1, further comprising a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit.

12. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by a multimode fiber pair.

13. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by single mode fiber.

14. (Currently Amended) A digital radio frequency transport system, comprising:

a digital host unit;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units;

wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit.

15. (Original) The system of claim 14, further comprising a wireless interface device coupled to the digital host unit.

16. (Original) The system of claim 15, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

17. (Currently Amended) The system of claim 15, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier ~~that is coupled to an antenna~~.

18. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the digital host unit.

19. (Previously Presented) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to the at least one digital expansion unit.

20. (Original) The system of claim 14, wherein the at least one digital expansion units are each coupled to the digital host unit via a multimode fiber pair.

21. (Original) The system of claim 14, wherein the at least one digital expansion unit is coupled to the digital host unit via a single mode fiber.

22. (Currently Amended) The system of claim 14, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to at least a portion of the [a] digitized radio frequency signals. ~~signal.~~

23. (Currently Amended) The system of claim 22, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signals into at least two digital signals for optical transmission to the at least two digital remote units.

24. (Original) The system of claim 14, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

25. (Currently Amended) A method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units;

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units;

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit;

receiving the multiple digital radio frequency signals at the digital host unit;

digitally summing the multiple digital radio frequency signals together; and

converting the summed multiple digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

26. (Original) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises amplifying the analog radio frequency signals.

27. (Previously Presented) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises synchronizing a reverse path local oscillator to a master clock so as to reduce end-to-end frequency translation.

28. (Currently Amended) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting the digitized radio frequency spectrum output by the shared analog-to-digital converter to a plurality of digital remote units;

receiving the digitized radio frequency spectrum at the plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

29. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum comprises amplifying the radio frequency signals.

30. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum digital radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

31. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises amplifying the analog radio frequency signals.

32. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

33. (Original) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit;

receiving the digitized radio frequency spectrum at the first plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units;

receiving the digital radio frequency signals at the at least one digital expansion unit;

optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units;

receiving the second digitized radio frequency spectrum at the second plurality of digital remote units;

converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

34. (Currently Amended) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the at least two digital remote units each include:

a main radio frequency antenna;

a duplexer coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path;

a radio frequency to digital converter coupled to the duplexer in the reverse path;

a digital to radio frequency converter coupled to the duplexer in the forward path;

a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path;

an optical transmitter coupled to an output of the multiplexer chip set; and

an optical receiver coupled to an input of the multiplexer chip set;

wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution <u>of digitized radio frequency signals</u> between the digital host unit and the at least two digital remote units;

<u>wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit</u>.

35. (Original) The system of claim 34, wherein the digital host unit includes an alarm/control interface circuit.

36. (Currently Amended) A digital radio frequency transport system, comprising:

a digital host unit, wherein the digital host unit includes a channel summer to digitally sum digitized RF signals received at the digital host;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

REMARKS

Applicant has reviewed the Office Action mailed on August 24, 2006 as well as the art cited. Claims 1-36 are pending in this application.

Objections to Drawings

The Office Action objected to the drawings under 37 CFR 1.83(a) as failing to show every feature of the invention specified in the claims. The Office Action took the position that the "wireless connection" and "antenna" of claims 4 and 17 are not shown in the claims.

In order to expedite prosecution, claims 4 and 17 have been amended to delete the reference to "antenna" from those claims.

Moreover, it is respectfully submitted the recitation of "wirelessly connects" in claims 4 and 178 is clearly show in FIG. 2 (line from left side of bi-directional amplifier 211).

Accordingly, it is respectfully requested that this rejection be withdrawn.

Double Patenting Rejection

Claims 1-36 were rejected under the judicially created doctrine of double patenting over claims 1-79 of U.S. Patent No. 6,704,545 A Terminal Disclaimer in compliance with 37 CFR 1.321(b)(iv) is enclosed herewith to over come these rejections.

Rejections Under 35 U.S.C. § 102

Claims 1-3, 5-12, 14-20, 22-24, 28, 30, and 34-36 were rejected under 35 USC § 102(b) as being anticipated by Russell (U.S. Patent No. 5,644,622).

In order to expedite prosecution, claim 1 has been amended to indicate "wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution of digitized radio frequency signals between the digital host unit and the at least two digital remote units" and "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit."

It is respectfully submitted that Russell does not teach or suggest "wherein the digital host unit digitally sums the digitized radio frequency signals received at the digital host unit" as

recited in amended claim 1. In connection with claim 25 of the present application, the Office Action took the position that since Russell shows that the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from the DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 would obviously be summed by a summing node similar to the one as shown in Fig. 13, in order to transport the two uplink signals back to the MTSO via a single carrier frequency.

Applicant respectfully notes that the summing node shown in Fig. 13 in the uplink direction is summing an analog RF signal that is output by the digital/optical transceiver unit 130 with an analog RF signal received by the main cell antenna; there is no teaching or suggestion that this summing is digital given that both signals are analog. *See, e.g.,* Russell, col. 10, lines 26-32 ("Unit 130 also receives a digitized RF signal over fiber 104B from a remote antenna unit 102, reconstructs the corresponding analog RF signal, and applies it to receivers 28. Accordingly, conventional equipment may be used on the downstream [typo in original -- should be upstream] (MTSO) side of digital transmitting/receiving unit 130."). Thus, any teaching or suggestion in Figures 12 and 13 of Russell regarding the summing of upstream RF signals received from multiple remote units 102 would relate to analog summation.

Accordingly, it is respectfully requested that this rejection of claim 1 be withdrawn. Claims 2-3 and 5-12 depend from claim 1. Consequently, it is respectfully requested that this rejection of these claims be withdrawn for at least the reasons set forth above with respect to claim 1.

In order to expedite prosecution, claims 14, 34, and 36 have also been amended, and it is respectfully submitted that the arguments set forth above with respect to claim 1 also apply to these claims as well. Claims 15-20 and 22-24 depend from claim 14 and claim 35 depends from claim 34. Consequently, it is respectfully requested that the rejection of these claims be withdrawn for at least the reasons set forth above with respect to claim 1.

In order to expedite prosecution, claim 28 has been amended so as to recite "converting, using a shared analog-to-digital converter, the radio frequency signals to a digitized radio frequency spectrum".

It is respectfully submitted that Russell does not teach or suggest this.

Claim 30 depends from claim 28 and therefore, the argument set forth above with respect to claim 28 applies to claim 30 as well.

Consequently, it is respectfully requested that the rejection of claims 28 and 30 be withdrawn for at least the reasons set herein.

Rejections Under 35 U.S.C. § 103

Claims 13, 21, 25-27, 29, 31, and 32 were rejected under 35 USC § 103(a) as being unpatentable over Russell ('622).

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to claims 13 and 21.

In order to expedite prosecution, claim 25 has also been amended, and it is respectfully submitted that the arguments set forth above with respect to claim 1 also apply to claim 25 as well. Claims 26-27 depend from claim 25.

Consequently, it is respectfully requested that the rejection of claims 13, 21, and 25-27 be withdrawn.

Claims 29, 31, and 32 depend from claim 28. Consequently, it is respectfully requested that the rejection of these claims be withdrawn for at least the reasons set forth above with respect to claim 28.

Claims 4 and 17 were rejected under 35 USC § 103(a) as being unpatentable over Russell ('622) in view of Kallander et al. (U.S. Patent No. 5,603,080).

It is respectfully submitted that at least the arguments set forth above with respect to claim 1 apply to claims 13 and 21. Consequently, it is respectfully requested that the rejection of these claims be withdrawn.

Claim 33 was rejected under 35 USC § 103(a) as being unpatentable over Russell ('622) in view of Beasley et al. (U.S. Patent No. 5,321,736).

The Office Action noted that Russell fails to teach or suggest the use of a digital expansion unit as recited in claim 33 of the present application. The Office Action took the position that using a repeater for extending the coverage area of an RF distribution system is well known (as disclosed by Beasley). The Office Action took the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Beasley's teaching into Russell for providing a digital repeater for extending the coverage area of the RF distribution system.

It is respectfully noted that Beasley is completely silent as to the use of a digital repeater – it clearly relates to an analog repeater. Also, Beasley is complete silent as to the use of optical transmission – Beasley clearly relates to the use of a coaxial cable for both communicating with and supplying power to the repeater. It is respectfully submitted that even if the use of a Beasley-type repeater (that is, a coax-fed, analog repeater) in an analog RF distribution system was well known (in order to address issues with such analog RF distribution systems), it does not follow that one of ordinary skill in the art would be motivated to use such a Beasley-type repeater in the digital RF system of Russell. Russell notes:

> Therefore, the invention eliminates the problems associated with analog AM (or FM) systems, such as that illustrated in the above-mentioned AT&T application, by using a digital transport resulting in better signal quality and for greater range between a base station and a microcell antenna unit. As employed in one exemplary embodiment, the invention greatly increases system capacity over existing mobile telephone systems without the requirement of deploying conventional base station equipment in each microcell area, and allows for provision of alternative services such as paging systems, mobile data services or personal communication networks. The present invention also improves the dynamic range of the signal and extends the distance signals may be reliably transported from the base stations to the antenna units.

Russell, column 4, lines 54 67. Moreover, Russell describes specific techniques suitable for use in extending the coverage area of such digital RF systems. There is no explanation in the Office Action as to why one of ordinary skill in the art would be motivated to use the Beasley analog-oriented approach suggested by the Office Action over such digital techniques disclosed in Russell. It is respectfully submitted that one of ordinary skill in the art would not be motivated to

make the combination proposed in the Office Action. *See also,* MPEP Section 2143.01 VI. (The proposed modification cannot change the principle of operation of a reference).

Accordingly, it is respectfully requested that the rejection of claim 33 be withdrawn.

CONCLUSION

Applicant respectfully submits that claims 1-36 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at 612.455.1681.

Respectfully submitted,

Date: 11-21-2006

Jon M. Powers
Reg. No. 43,868

Attorneys for Applicant
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Applicant	Wala	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER PRIOR ART PATENT**
Serial No.	10/740,944	
Filing Date	12/19/2003	
Group Art Unit	2618	
Confirmation No.	3898	
Examiner Name	Nguyen, Duc M.	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Owner, ADC Telecommunications, Inc., with a business address of 13625 Technology Drive, Eden Prairie, MN 55344-2252, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. §§ 154 to 156 and 173, as presently shortened by any terminal disclaimer, of U.S. Patent 6,704,545. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior respective patents are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors, or assigns.

In making the above disclaimer, the Owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. §§ 154 to 156 and 173 of any of the prior patents, as presently shortened by any terminal disclaimer, in the event that they later: expire for failure to pay a maintenance fee, are held unenforceable, are found invalid by a court of competent jurisdiction, are statutorily disclaimed in whole or terminally disclaimed under 37 CFR § 1.321, have all claims canceled by a reexamination certificate, are reissued, or are in any manner terminated prior to the expiration of their full statutory term as presently shortened by any terminal disclaimer.

Authorization to a Credit Card for payment of the Terminal Disclaimer fee of $130.00 pursuant to 37 C.F.R. § 1.20(d) is provided herewith. Please charge any further fees deemed necessary or credit any overpayment to Deposit Account No. 502432.

The undersigned attorney is authorized to act on behalf of the assignee.

The Examiner is invited to contact the below-signed attorney if any further assistance is required.

Respectfully submitted,

Date: 11-21-2006

Jon M. Powers
Reg. No. 43,868

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Electronic Patent Application Fee Transmittal

Application Number:	10740944
Filing Date:	19-Dec-2003
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Filer:	Jon M. Powers/Lisa Gentry
Attorney Docket Number:	100.019US02

Filed as Large Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Processing Fee, except for Provis. apps	1808	1	130	130
		Total in USD ($)		**130**

Electronic Acknowledgement Receipt

EFS ID:	1326632
Application Number:	10740944
International Application Number:	
Confirmation Number:	3898
Title of Invention:	Point-to-multipoint digital radio frequency transport
First Named Inventor/Applicant Name:	Philip M. Wala
Customer Number:	34206
Filer:	Jon M. Powers/Lisa Gentry
Filer Authorized By:	Jon M. Powers
Attorney Docket Number:	100.019US02
Receipt Date:	21-NOV-2006
Filing Date:	19-DEC-2003
Time Stamp:	11:57:14
Application Type:	Utility

Payment information:

Submitted with Payment	yes
Payment was successfully received in RAM	$130
RAM confirmation Number	1289
Deposit Account	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part /.zip	Pages (if appl.)

1		00083891.pdf	684991	yes	16

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment - After Non-Final Rejection	1	1
Claims	2	9
Applicant Arguments/Remarks Made in an Amendment	10	14
Terminal Disclaimer Filed	15	16

Warnings:

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	8176	no	2

Warnings:

Information:

Total Files Size (in bytes):	693167

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

Document code: WFEE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/740,944	12/19/2003	Philip M. Wala	100.019US02	3898

34206 7590 08/24/2006

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P.O. BOX 581339
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EXAMINER	
NGUYEN, DUC M	
ART UNIT	PAPER NUMBER
2618	

DATE MAILED: 08/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/740,944	WALA, PHILIP M.	
	Examiner	Art Unit	
	Duc M. Nguyen	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/19/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 12/19/03 is being considered by the examiner.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "wireless connection" and the "antenna" coupled to the bi-directional amplifier as recited in claims 4, 17, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims **1-36** are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-79 of U.S. Patent No. 6,704,545. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both direct to a RF distribution system wherein a digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims **1-3, 5-12, 14-20, 22-24, 28, 30, 34-36** are rejected under 35 U.S.C. 102(b) as being anticipated by **Russell** et al (US **5,644,622**).

Regarding claim **1, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12, 8 and col. 13, lines 1-47), wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **2, Russell** would disclose a wireless interface device coupled to the digital host unit (see either "T1 interface 202" in Fig. 11A or "radio controller 22" in Fig. 11B). In the alternative way, the "head end" in Figs. 17, 19 would read on the "digital host unit", and the "base station 330" in Figs. 17, 18 would read on the "wireless interface device".

Regarding claim **3, Russell** would disclose the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables (see Figs 17, 18 regarding the "base station 330").

Regarding claim **5, Russell** would disclose the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals (see Fig. 8).

Regarding claim **6, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **7,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B so that the above feature (splitting the transmit signal to two digital remote units 102) could be performed.

Regarding claim **8, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **9, Russell** would disclose the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair (see Fig. 13 regarding the multimode fiber pair 104A and 104B).

Regarding claim **10, Russell** would disclose the digital host unit further comprises an alarm/control interface circuit 161 coupled to the multiplexer (see Fig. 19).

Regarding claim **11, Russell** would disclose a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit (see Fig. 14), wherein the wave division multiplexer (WDM) would read on the "digital expansion unit" as claimed (see col. 15, lines 25-36).

Regarding claim **12, Russell** would disclose the digital expansion unit (WDM) is coupled to the digital host unit 106 by a multimode fiber pair (see Fig. 14).

Regarding claim **14,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above.

Regarding claim **15,** the claim is interpreted and rejected for the same reason as set forth in claim **2** above.

Regarding claim **16,** the claim is interpreted and rejected for the same reason as set forth in claim **3** above.

Regarding claim **18, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the digital host unit 106 (via the WDM) as claimed (see Fig. 14).

Regarding claim **19, Russell** would disclose at least one of the at least two digital remote units 102 is coupled to the at least one digital expansion units (WDM 270) as claimed (see Fig. 14).

Regarding claim **20,** the claim is interpreted and rejected for the same reason as set forth in claim **12** above.

Regarding claim **22, Russell** would disclose the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal (see transceiver 130 in Figs 3, 4 and Fig. 21A regarding broadband digitizer 132).

Regarding claim **23,** it is clear that in order for the digital host unit 106 to split the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units 102 as shown in Fig. 12, **Russell** would implicitly disclose the digital host unit further includes a multiplexer (or splitter) as shown in Fig. 21B for performing the above feature.

Regarding claim **24, Russell** would disclose the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction (see Figs. 21A and 21B regarding A/D and D/A converters of the digital/optical transceiver 130 and col. 32, line 62 – col. 33, line 27 regarding the LO, reference LO and synchronization operations).

Regarding claim **28, Russell** discloses a method of performing point-to-multipoint digital radio frequency transport, the method comprising:

- receiving radio frequency signals at a digital host unit (see Figs. 3, 4);

- converting the radio frequency signals to a digitized radio frequency spectrum (see Fig. 4 regarding broadband digitizer 132);

- optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units (see Figs. 3, 4 and 12 regarding digital transmitter and DRTs 102);

- receiving the digitized radio frequency spectrum at the plurality of digital remote units (see Fig. 8 regarding receiver 160) ;

- converting the digitized radio frequency spectrum to analog radio frequency signals (see Fig. 8 regarding D/A 164); and

- transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units (see Fig. 8 regarding antenna 26).

Regarding claim **30,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the radio frequency signal to a digitized radio frequency sprectrum comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21B regarding digital-to-analog converter 144 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claim **34, Russell** discloses a digital radio frequency transport system, comprising:

a digital host unit 106 (see Figs. 12, 13 and col. 15, lines 12-25); and

at least two digital remote units 102 coupled to the digital host unit (see Fig. 12), wherein the at least two digital remote units each include :

a main radio frequency antenna 26 (see Fig. 8);

a duplexer (25) coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path (see Fig. 8);

a radio frequency to digital converter (170) coupled to the duplexer in the reverse path (see Fig. 8);

a digital to radio frequency converter (164) coupled to the duplexer in the forward path (see Fig. 8);

a multiplexer (162, 172) chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path (see Fig. 8);

an optical transmitter (174) coupled to an output of the multiplexer chip set (see Fig. 8); and

an optical receiver (160) coupled to an input of the multiplexer chip set (see Fig. 8);

wherein the digital host unit includes shared circuitry (transceiver unit 130) that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units (see Fig. 12, 13), wherein it is clear that the digital transmitter/receiver circuits of the transceiver unit 130 are shared by digital remote units 102.

Regarding claim **35,** the claim is interpreted and rejected for the same reason as set forth in claim **10** above regarding the "alarm/control interface".

Regarding claim **36,** the claim is interpreted and rejected for the same reason as set forth in claim **11** above regarding the "digital expansion unit".

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims **13, 21, 25-27, 29, 31, 32** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell**.

Regarding claim **13,** although **Russell** would disclose the digital expansion unit is coupled to the digital host unit by a multimode fiber pair, it is noted that Russell also suggests that a single mode fiber 271 could be used in place of the multimode fiber pair 104A and 104B (see Fig. 14 and col. 15, lines 30-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Russell, for providing a single mode fiber as claimed, for simplifying the process of installing fiber cables.

Regarding claim **21,** the claim is interpreted and rejected for the same reason as set forth in claim **13** above.

Regarding claim **25, Russell** discloses a method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units (see Figs. 8, 24);

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units (see broadband A/D 170 in Fig. 8)

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit (see Fig. 8 and Fig. 13 regarding the Receive path in the fiber 104B direction);

receiving the multiple digital radio frequency signals at the digital host unit (see Fig. 12 regarding two DRTs 102);

summing the multiple digital radio frequency signals together (see the summing node in Fig. 13); and

converting the digital radio frequency signals back to analog radio frequency signals (see D/A CONV 144 in Fig. 4 which is a component of a receiver in Fig. 13 or Fig. 3), and

transmitting the signals to a wireless interface device for further transmission to a switched telephone network (see Fig. 3, wherein the radio controller 22 would read on the "wireless interface device").

Here, regarding the summing function, it is noted that since the digital host unit 106 is coupled to at least two DRTs 102 in Fig. 12 for extending the coverage area, it is clear that in the reverse path from the DRT 102 to the digital host unit 106, uplink signals from these two DRTs 102 would obviously be summed by a summing node similar to the one as shown in Fig. 13, in order to transport the two uplink signals back

to the MTSO via a single carrier frequency. Therefore, the claimed limitation regarding the summing function is made obvious by **Russell**.

Regarding claim **26,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier (i.e, LNA) at the receiver for amplifying signal before processing the signal is well known in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier as claimed, for improving the signal reception quality.

Regarding claim **27,** the claim is rejected for the same reason as set forth in claim **25** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

Regarding claims **29, 31,** the claims are rejected for the same reason as set forth in claim **25** above. In addition, since the use of an amplifier for amplifying signal before processing the signal is well known in the art (Official Notice), it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Russell** for providing an amplifier during A/D and/or D/A conversions as claimed, for improving the signal quality, thereby improving the performance of the A/D and/or D/A conversions.

Regarding claim **32,** the claim is rejected for the same reason as set forth in claim **28** above. In addition, **Russell** discloses converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation (see Fig. 21A regarding analog-to-digital converter 132 and col. 32, line 62 – col. 33, line 28), wherein it is clear that the synchronization is used to reduce end-to-end frequency translation (intended use).

9. Claims **4, 17,** are rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Kallander et al** (US Patent Number **5,603,080**).

Regarding claim **4,** it is rejected for the same reason as set forth in claim **2** above regarding the separation of the "digital host unit" head end and the "base station 330" in Fig. 17. However, **Russell** fails to disclose a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna. However, it is noted that **Russell** also suggests the deployment of the digital RF distribution in a closed environment such as inside a building or other structures (see col. 10, lines 2-6). Therefore, by deploying the digital RF distribution in a closed environment such as inside a building or tunnel, it is clear that the "digital host unit" or "head end" and the base station would be wirelessly coupled via an antenna in the similar way as disclosed **Kallander** (see Fig. 4A). Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a bi-directional amplifier along the cable as disclosed by **Kallander** (see col. 4, lines 54-67) to compensate for propagation

loss in both directions, caused by a long cable transmission, thereby ensuring good signal quality and sufficient signal strength of the data transmission.

Regarding claim **17,** the claim is interpreted and rejected for the same reason as set forth in claim **4** above.

10. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable by **Russell** in view of **Beasley et al** (US Patent Number **5,321,736**).

Regarding claim **33,** the claim is interpreted and rejected for the same reason as set forth in claim **28** above. However, Russell fails to disclose a digital expansion unit for re-transmitting the digital signal to a second plurality of digital remote units. However, it is noted that using a repeater for extending coverage area of an RF distribution system is well known in the art as disclosed by **Beasley** (see Figs. 1A and 1B). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Beasley's teaching to Russell, for providing a digital repeater (read on the "digital expansion unit") to the digital RF distribution in Russell as well, thereby providing a digital expansion unit coupled to a second plurality of digital remote units as claimed, for extending coverage area of the RF distribution system.

Response to Arguments

11. Applicant's arguments with respect to claims 1-36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US005802173A to Hamilton-Piercy et al, US006005884A to Cook et al, US005708961A to Hylton et al, US006317884B1 to Eames et al, and US006181687B1 to Bisdikian.

13. **Any response to this action should be mailed to:**

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for **formal** communications intended for entry)

(571)-273-7893 (for informal or **draft** communications).

Hand-delivered responses should be brought to Customer Service Window, Randolph Building, 401 Dulany Street, Alexandria, VA 22314.

Any inquiry concerning this communication or communications from the examiner should be directed to Duc M. Nguyen whose telephone number is (571) 272-7893, Monday-Thursday (9:00 AM - 5:00 PM).

Or to Matthew Anderson (Supervisor) whose telephone number is (571) 272-4177.

Duc M. Nguyen, P.E.

Aug 18, 2006

12/19/03

PTO/SB/08A (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	Not Assigned
Filing Date	Even Date Herewith
First Named Inventor	Wala
Art Unit	Not Assigned 2618
Examiner Name	Not Assigned D NGUYEN
Attorney Docket Number	100.019US02

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number - Kind[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
DN		US-4,760,573	7/26/1988	Calvignac et al.	
		US-5,603,080	2/11/1997	Kallander et al.	
		US-5,621.786	4/15/1997	Fischer et al.	
		US-5,627,879	5/6/1997	Russell et al.	
		US-5,642,405	6/24/1997	Fischer et al.	
		US-5,644,622	7/1/1997	Russell et al.	
		US-5,657,374	8/12/1997	Russell et al.	
		US-5,765,097	6/9/1998	Dail	
		US-5,765,099	6/9/1998	Georges et al.	
		US-5,774,789	6/30/1998	Van der Kaay et al.	
		US-5,852,651	12/22/1998	Fischer et al.	
		US-5,878,325	3/2/1999	Dail	
		US-5,946,622	8/31/1999	Bojeryd	
		US-5,969,837	10/19/1999	Farber et al.	
		US-6,112,086	8/29/2000	Wala	
		US-6,147,786	11/14/2000	Pan	
		US-6,198,558	3/6/2001	Graves et al.	
		US-6,362,908	3/26/2002	Kimbrough et al.	
DN		US-6,486,907	11/26/2002	Farber et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] -Number[4] -Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
DN		DE - -3707244-- A	9/15/1988	Schalamon		
DN		EP - -0 664 621	7/26/1994	Zarem et al.		

Examiner Signature	/Duc Nguyen/	Date Considered	08/16/2006

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

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PTO/SB/08B (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
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Substitute for form 1449B/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	Not Assigned
Filing Date	Even Date Herewith
First Named Inventor	Wala
Art Unit	Not Assigned 2618
Examiner Name	Not Assigned D. NGUYEN
Attorney Docket Number	100.019US02

OTHER PRIOR ART -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, pate(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
DN		AKOS ET AL., DIRECT BANDPASS SAMPLING OF MULTIPLE DISTINCT RF SIGNALS, 7/1999, Page(s) 983-988, Volume 47, Publisher: IEEE Transactions on Communications.	
DN		FOXCOM WIRELESS PROPERIETARY INFORMATION, LITENNA IN-BUILDING RF DISTRIBUTION SYSTEM, Page(s) 1-8, 1998.	
DN		FOXCOM WIRELESS PROPRIETARY INFORMATION, APPLICATION NOTE RFIBER-RF FIBEROPTIC LINKS FOR WIRELESS APPLICATIONS, Page(s) 3-11, 1998.	
DN		NAKATSUGAWA ET AL., SOFTWARE RADIO BASE AND PERSONAL STATIONS FOR CELLULAR/PCS SYSTEMS, Page(s) 617-621, Publisher: IEEE, 2000.	
DN		Gallagher, U.S. Serial No. 09/273,197, "DIGITAL RETURN PATH FOR HYBRID/FIBER COAX NETWORK", filed on March 19, 1999 (copy enclosed).	
DN		Donohue et al., U.S. Serial No. 09/432,558, "DIGITAL NODE FOR HYBRID/FIBER COAX NETWORK", filed on November 3, 1999 (copy enclosed).	
DN		Donohue, U.S. Serial No. 09/433,332, "DIGITAL RETURN PATH FOR HYBRID/FIBER COAX NETWORK", filed on November 3, 1999 (copy enclosed).	

Examiner Signature	/Duc Nguyen/	Date Considered	08/16/2006

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time your are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Notice of References Cited	Application/Control No. 10/740,944	Applicant(s)/Patent Under Reexamination WALA, PHILIP M.	
	Examiner Duc M. Nguyen	Art Unit 2618	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,321,736 A	06-1994	Beasley, Andrew S.	455/11.1
*	B	US-6,005,884 A	12-1999	Cook et al.	375/132
*	C	US-6,181,687 B1	01-2001	Bisdikian, Chatschik	370/347
*	D	US-5,802,173 A	09-1998	Hamilton-Piercy et al.	379/56.2
*	E	US-6,317,884 B1	11-2001	Eames et al.	709/217
*	F	US-5,708,961	01-1998	Hylton et al.	725/81
*	G	US-6,275,990 B1	08-2001	Dapper et al.	725/106
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Bib Data Sheet

CONFIRMATION NO. 3898

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/740,944	12/19/2003 RULE	455	2618	100.019US02

APPLICANTS
Philip M. Wala, Waseca, MN;

** CONTINUING DATA **********
This application is a CON of 09/619,431 07/19/2000 PAT 6,704,545 Yes DW

** FOREIGN APPLICATIONS ********** No DW

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 03/29/2004

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☒ no	MN	8	36	7

35 USC 119 (a-d) conditions met: ☐ yes ☒ no ☐ Met after Allowance

Verified and Acknowledged: _____ Examiner's Signature _____ Initials

ADDRESS
34206

TITLE
Point-to-multipoint digital radio frequency transport

FILING FEE RECEIVED	FEES: Authority has been given in Paper
1402	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:

- ☐ All Fees
- ☐ 1.16 Fees (Filing)
- ☐ 1.17 Fees (Processing Ext. of time)
- ☐ 1.18 Fees (Issue)
- ☐ Other _____
- ☐ Credit

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/740,944	WALA, PHILIP M.
Examiner	**Art Unit**
Duc M. Nguyen	2618

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date
Final	Original	1/9/13 06
	(1)	✓
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Claim		Date
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Claim		Date
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Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination
10/740,944	WALA, PHILIP M.
Examiner	**Art Unit**
Duc M. Nguyen	2618

SEARCHED			
Class	Subclass	Date	Examiner
455	7 14->22	8/10/2006	DN
	553 561		
	3.01 3.05		
370	906		
	907		
	498 501		
	535->537	8/10/2006	DN

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST	8/10/2006	DN
EAST	8/17/2006	DN

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L6	81	(digital near3 (RF radio) near5 distribut$7).ti,ab.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/17 10:13
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L11	52	("4748655" | "4771448" | "4790000" | "4980907" | "4989230" | "5036531"). PN. OR ("5235632").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/17 11:35
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L13	71	("3750020" | "3868575" | "3916311" | "3979674" | "4476574" | "4677687" | "4718108" | "4742514" | "4754450" | "4777652" | "4873711" | "4972505" | "5010583" | "5018165" | "5047762" | "5058201" | "5187803" | "5187806" | "5278989" | "5404570").PN. OR ("5603080").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/17 11:40

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EAST Search History

L14	25	("4006315" | "4539706" | "4764979" | "4882765" | "5025452" | "5081703" | "5152002" | "5309479" | "5377255" | "5408679" | "5603080" | "5604789" | "5697052" | "5774789" | "5802452" | "5809398" | "5812538" | "5890055" | "5956620" | "5970410" | "5987304" | "6047177" | "6181951" | "6243577" | "6370384").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/17 11:43
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L16	2	15 and cook.in.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/17 11:44
L17	71	("3750020" | "3868575" | "3916311" | "3979674" | "4476574" | "4677687" | "4718108" | "4742514" | "4754450" | "4777652" | "4873711" | "4972505" | "5010583" | "5018165" | "5047762" | "5058201" | "5187803" | "5187806" | "5278989" | "5404570").PN. OR ("5603080").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/17 11:48
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EAST Search History

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L24	31	("3028489" | "3411088" | "3450841" | "4041389" | "4198600" | "4317216" | "4475243").PN. OR ("4754495").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/17 12:02
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L28	3	"6667994"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/17 13:25
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EAST Search History

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L3	24	08/673002	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/10 15:17
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L5	14	("5666487" | "5793410" | "5864415" | "6041056").PN. OR ("6198558").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/10 16:37
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L7	1	10/128472	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/10 16:54
L8	7	ADC and DRU and DHU and DEU	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/10 16:57
L9	7	ADC and DRU and DHU	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/10 16:59
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EAST Search History

L11	8	("5181106" | "5189671" | "5754941" | "5978374" | "6023467" | "6198558" | "6215789" | "6347096").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/10 17:11
L12	1	"6198558".pn. and distribut$6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/08/10 18:59
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EAST Search History

L19	56	("3931473" | "3995144" | "4112488" | "4244046" | "4354167" | "4402076" | "4531239" | "4754451" | "4816825" | "4920533" | "4959829" | "5136410" | "5138440" | "5198989" | "5272700" | "5341216" | "5442700" | "5469495" | "5469545" | "5557319" | "5586121" | "5587734" | "5621786" | "5630204" | "5631757" | "5680130" | "5729370" | "5754552" | "5765097" | "5765099" | "5768682" | "5774789" | "5777544" | "5790806" | "5828677" | "5838989" | "5859895" | "5864672" | "5864748" | "5867485" | "5872810" | "5878325" | "5930262" | "5946622" | "5963844" | "5986691" | "5987061" | "6112086" | "6148006" | "6163537" | "6181687" | "6282683" | "6356369" | "6377782" | "6480748" | "6490727").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2006/08/10 19:40

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Page 513

10/710 944

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2003

Application or Docket Number: 100.019US02

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	36	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	36 minus 20=	* 16
INDEPENDENT CLAIMS	7 minus 3 =	* 4
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	385.00	OR	BASIC FEE	770.00
X$ 9=		OR	X$18=	288
X43=		OR	X86=	344
+145=		OR	+290=	
TOTAL		OR	TOTAL	1402

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 36	Minus	** 36	=
Independent	* 7	Minus	*** 7	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

PTO/SB/07 (08-03)
Approved for use through 7/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number: 10/740944
Filing Date:
Applicant(s)

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT			*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend		Indep	Depend	Indep	Depend	Indep	Depend
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2		1		1			52						
3		1		1			53						
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10		1		1			60						
11		1		1			61						
12		1		1			62						
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22		1		1			72						
23		1		1			73						
24		1		1			74						
25	1		1				75						
26		1		1			76						
27		1		1			77						
28	1		1				78						
29		1		1			79						
30		1		1			80						
31		1		1			81						
32		1		1			82						
33	1		1				83						
34	1		1				84						
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50							100						
Total Indep	7		7				Total Indep						
Total Depend	28		28				Total Depend						
Total Claims	36		36				Total Claims						

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APPL NO.	FILING OR 371 (c) DATE	ART UNIT	FIL FEE REC'D	ATTY.DOCKET NO	DRAWINGS	TOT CLMS	IND CLMS
10/740,944	12/19/2003	2681	1402	100.019US02	8	36	7

CONFIRMATION NO. 3898

34206
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P.O. BOX 581339
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FILING RECEIPT

OC000000012223636

Date Mailed: 03/30/2004

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Applicant(s)

Philip M. Wala, Waseca, MN;

Assignment For Published Patent Application

ADC Telecommunications, Inc., Eden Prairie, MN;

Domestic Priority data as claimed by applicant

This application is a CON of 09/619,431 07/19/2000 PAT 6,704,545

Foreign Applications

If Required, Foreign Filing License Granted: 03/29/2004

Projected Publication Date: 07/08/2004

Non-Publication Request: No

Early Publication Request: No

Title

Point-to-multipoint digital radio frequency transport

Preliminary Class

455

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OIPE JC56 MAR 15 2004 PATENT & TRADEMARK OFFICE

Applicant(s)	Wala
Serial No.	10/740,944
Filing Date	December 19, 2003
Group Art Unit	Unassigned
Examiner	Unassigned
Attorney Docket No.	100.019US02

TRANSMITTAL FORM UNDER 37 CFR 1.8 (LARGE ENTITY)

Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Enclosures

The following documents are enclosed:

X Preliminary Amendment (21 pgs.).
X A return postcard.

Please charge any additional fees or credit any overpayments to Deposit Account No. 502432.

CUSTOMER NO. 34206

Submitted By

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Name	Lisa D. Gentry	Signature	Lisa D. Gentry

OIPE JC56 MAR 15 2004 PATENT & TRADEMARK

Applicant(s)	Wala
Serial No.	10/740,944
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Group Art Unit	Unassigned
Examiner	Unassigned
Attorney Docket No.	100.019US02
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT	

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Prior to taking the above-identified application under consideration, please amend the application as follows:

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 9 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of claims:

1. (Original) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

2. (Original) The system of claim 1, further comprising a wireless interface device coupled to the digital host unit.

3. (Original) The system of claim 2, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

4. (Original) The system of claim 2, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna.

5. (Original) The system of claim 1, wherein the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals.

6. (Original) The system of claim 1, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal.

7. (Original) The system of claim 6, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units.

8. (Original) The system of claim 1, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

9. (Original) The system of claim 1, wherein the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair.

10. (Original) The system of claim 7, wherein the digital host unit further comprises an alarm/control interface circuit coupled to the multiplexer.

11. (Original) The system of claim 1, further comprising a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit.

12. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by a multimode fiber pair.

13. (Original) The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by single mode fiber.

14. (Original) A digital radio frequency transport system, comprising:
a digital host unit;
at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

15. (Original) The system of claim 14, further comprising a wireless interface device coupled to the digital host unit.

16. (Original) The system of claim 15, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

17. (Original) The system of claim 15, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier that is coupled to an antenna.

18. (Currently Amended) The system of claim 14, wherein at least one of the at least two digital remote units is ~~to~~ coupled to the digital host unit.

19. (Currently Amended) The system of claim 14, wherein at least one of the at least two digital remote units is coupled to ~~one of~~ the at least ~~two~~ one digital expansion units.

20. (Original) The system of claim 14, wherein the at least one digital expansion units are each coupled to the digital host unit via a multimode fiber pair.

21. (Original) The system of claim 14, wherein the at least one digital expansion unit is coupled to the digital host unit via a single mode fiber.

22. (Original) The system of claim 14, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal.

23. (Original) The system of claim 22, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units.

24. (Original) The system of claim 14, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

25. (Original) A method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units;

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units;

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit;

receiving the multiple digital radio frequency signals at the digital host unit;

summing the multiple digital radio frequency signals together; and

converting the digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

26. (Original) The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises amplifying the analog radio frequency signals.

27. **(Currently Amended)** The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises synchronizing a reverse path local oscillator to a master clock so as to reduce end-to-end frequency translation.

28. (Original) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units;

receiving the digitized radio frequency spectrum at the plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

29. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum comprises amplifying the radio frequency signals.

30. (Original) The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum digital radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

31. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises amplifying the analog radio frequency signals.

32. (Original) The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

33. (Original) A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit;

receiving the digitized radio frequency spectrum at the first plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units;

receiving the digital radio frequency signals at the at least one digital expansion unit;

optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units;

receiving the second digitized radio frequency spectrum at the second plurality of digital remote units;

converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

34. (Original) A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the at least two digital remote units each include:

a main radio frequency antenna;

a duplexer coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path;

a radio frequency to digital converter coupled to the duplexer in the reverse path;

a digital to radio frequency converter coupled to the duplexer in the forward path;

a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path;

an optical transmitter coupled to an output of the multiplexer chip set; and

an optical receiver coupled to an input of the multiplexer chip set;

wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

35. (Original) The system of claim 34, wherein the digital host unit includes an alarm/control interface circuit.

36. (Original) A digital radio frequency transport system, comprising:

a digital host unit, wherein the digital host unit includes a channel summer;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

REMARKS

Claims 1-36 are currently pending in the application. Claims 1-36 were originally presented in parent application no. 09/619,431 (Patent No. 6,704,545) as numbered as 1-9, 17, 25, 31-40, 46-48, 57-67 and 83, respectively. Claims 18, 19 and 27 have been amended to correct typographical errors and antecedent basis issues. No new matter has been added.

Rejections Under 35 U.S.C. § 102

Claims 1, 9 were rejected under 35 USC § 102(e) as being anticipated by Graves et al., (U.S. Patent No. 6,198,558). Applicant respectfully traverses the Examiner's rejections.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Verdegaal *Bros. v. Union oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). MPEP §2131.

Claim 1 **(Original Claim 1)**

Claim 1 is directed to a digital radio frequency transport system. The system includes a digital host unit and at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

Applicant asserts that Graves et al. does not teach or suggest a **digital radio frequency transport system** as found in claim 1. In particular, Graves does not disclose shared circuitry that performs bi-directional simultaneous **digital radio frequency distribution** between the digital host unit and the at least two digital remote units as found in claim 1. The Examiner points to Abstract, Figs. 1A, 1B, col.4, lines 1-53 and col. 9, lines 5-63 of Graves et al to support the argument that Graves anticipates the limitation of "shared circuitry that performs bi-directional simultaneous digital RF distribution between the digital host unit and at least two digital remote units" of claim 1. In particular, the Examiner states that "Graves discloses an improved access system comprising a HDT . . . wherein the HDT includes shared circuitry that performs bi-directional simultaneous digital RF distribution between the HDT and at least two RDTs." However, Graves et al does not disclose "shared circuitry that perform bi-directional

simultaneous **digital RF distribution** between the digital host unit and at least two digital remote units" as found in claim 1. Graves does not teach or suggest digital RF distribution. In contrast, Graves et al discusses "An improved access system for use in a Fiber-in-The-Loop (FITL) communications network." (See Abstract in Graves) As a result, claim 1 is not anticipated by Graves and Applicant respectfully requests the allowance of Claim 1.

Claims 2-9 (Original Claims 2-9), Claim 10 (Original Claim 17), Claim 11 (Original Claim 25) and Claims 12-13 (Original Claims 31-32) depend from and further define allowable claim 1 and for at least the reasons provided above are also allowable. In addition, since the Applicant believes the dependent claims are allowable for the above reasons, not all rejections of said claims may have been addressed in this response. Hence, Applicant retains the right to address said rejections if a further response is required. As a result, claims 2-13 should also be allowed.

Claim 9 (**Original Claim 9**)

As mentioned above, Claim 9 depends from and further defines allowable claim 1 and for at least the reasons provided above is also allowable. Further, the Examiner asserts that "since Graves discloses multiple optical fibers come together at a passive optical splitter 30 (see col. 9, lines 15-22) and a signaling processor for handling different formats, it is clear that such splitter is a multimode fiber pair." Applicant respectfully traverses this assertion. Applicant carefully reviewed Graves, with particular emphasis on the portions identified by the Examiner, and found no indication that the reference teaches or suggests "the digital host unit is coupled to each of the at least two digital remote units by a **multimode fiber pair**" as found in claim 9.

Col. 9, lines 15-22 of Graves states:

> "Multiple optical fibers come together at a passive optical splitter 30, which in the upstream direction adds the optical energy on each fiber and sends the resultant signal along an umbilical link 4*a* to the HDT, and in the downstream direction splits the downstream optical signals on the fiber umbilical 4*a* into a number of identical optical signals traveling along respective individual fibers 4."

Applicant does not find a basis for the Examiner's assertion that splitter 30 of Graves is a multi-mode fiber pair as found in claim 9. Applicant finds that the Examiner fails to make a prima facie case of anticipation of claim 9. The Examiner has not shown that each and every

element as set forth in claim 9 is either expressly or inherently described in Graves. As a result claim 9 is allowable and allowance is requested.

Rejections Under 35 U.S.C. § 103

Claims 8 (Original Claim 8), 10 (Original Claim 17), 11 (Original Claim 25), 12-14 (Original Claims 31-33), 18-21 (Original Claims 37-40), 24 (Original Claim 48) and 36 (Original Claim 83) were previously rejected under 35 USC § 103(a) as being unpatentable over Graves et al., (U.S. Patent No. 6,198,558).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). MPEP § 2143 - § 2143.03.

Claim 8 **(Original Claim 8)**

As stated above, Claim 8 depends from and further defines allowable claim 1 and for at least the reasons provided above is also allowable. In addition, the Examiner asserts that Graves discloses all of the claimed limitations of claim 8 except for oscillators for synchronization of RF signals. Applicant notes that the Examiner correctly states that Graves does not disclose oscillators for synchronization of RF signals as found in claim 8. Further, Applicant does not find that Graves teaches or suggests "the digital host unit including local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction" as found in claim 8. Applicant traverses the Examiner's assertion that "it would have been obvious to one of ordinary skill in the art such processor should comprise oscillators as claimed." Further, Applicant has carefully reviewed the cited reference and does not find that Graves teaches or suggests local oscillators coupled to a reference oscillator for

synchronization as found in claim 8. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 8. Withdrawal of the rejection is respectfully requested.

Claim 10 **(Original Claim 17)**

As stated above, Claim 10 depends from and further defines allowable claim 1 and for at least the reasons provided above is also allowable. In addition, the Examiner asserts that Graves discloses all of the claimed limitations of claim 10, except for an alarm/control interface. Applicant notes that the Examiner correctly states that Graves does not disclose an alarm/control interface. Applicant has carefully reviewed the cited reference and does not find that Graves teaches or suggests "the digital host unit further comprising alarm/control interface circuit coupled to the multiplexer" as found in claim 10. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 10. Withdrawal of this rejection is respectfully requested.

Claim 11 **(Original Claim 25)**

As stated above, Claim 11 depends from and further defines allowable claim 1 and for at least the reasons provided above is also allowable. In addition, the Examiner asserts that Graves discloses all of the claimed limitations of claim 11, except for a digital expansion unit. Applicant notes that the Examiner correctly states that Graves fails to teach a digital expansion unit. Applicant finds that Graves does not teach or suggest a digital expansion unit or a digital expansion unit that contains circuitry that performs **bi-directional simultaneous digital radio frequency distribution** between the digital host unit and the digital remote unit as found in claim 11. Applicant respectfully traverses the further assertion that the use of a repeater or amplifier reads on the digital expansion unit as claimed. The Examiner has failed to provide a basis for this assertion. Graves does not teach or suggestion bi-directional simultaneous digital radio frequency distribution as found in claim 11 and additionally does not teach or suggest a digital expansion unit that contains circuitry that performs this distribution. Further, Graves does not teach or suggest the digital expansion unit as found in claim 11 and defined within the specification (See Page 10, lines 20-23 as well as other locations). As a result, Examiner has

failed to establish a prima facie case of obviousness with respect to claim 11. Withdrawal of the rejection is respectfully requested.

Claim 12 (**Original Claim 31**)

As stated above, Claim 12 depends from and further defines allowable claim 1 and for at least the reasons provided above is also allowable. Applicant notes that the Examiner correctly states that Graves fails to disclose a digital expansion unit as found in claim 12. In addition, Graves does not teach a digital expansion unit or a digital expansion unit that contains circuitry that performs **bi-directional simultaneous digital radio frequency distribution** between the digital host unit and the digital remote unit as discussed above with respect to claim 11. The Examiner further rejects claim 12 and states that "since Graves discloses multiple optical fibers come together at a passive optical splitter 30 (see col. 9, lines 15-22) and a signaling processor for handling different formats, it is clear that such splitter is multimode fiber pair." As discussed above with regard to claim 9, Applicant does not find a basis for the Examiner's assertion that splitter 30 of Graves is a multi-mode fiber pair as found in claims 9 and 12.

Applicant respectfully traverses this rejection. Applicant carefully reviewed Graves, with particular emphasis on the portions identified by the Examiner, and found no indication that the reference teaches or suggests "the digital expansion unit is coupled the digital host unit by a **multimode fiber pair**" as in claim 12. The Examiner has failed to provide a prima facie case of obviousness and claim 12 should also be allowed.

Claim 13 (**Original Claim 32**)

Claim 13 depends from and further defines allowable claims 1 and 11 and for at least the reasons provided above is also allowable. As provided by the argument with respect to claim 11 above, Graves does not teach or suggest a digital expansion unit coupled to the digital host unit. Applicant strongly traverses the Examiners assertion that "it would have been obvious to one of ordinary skill in the art to further modify Graves for using a single mode fiber as claimed, for cost saving." Applicant understands that the Examiner's assumption is erroneous. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 13. Withdrawal of the rejection is respectfully requested.

Claim 14 **(Original Claim 33)**

Claim 14 is directed to a digital radio frequency transport system. The system includes a digital host unit, at least one digital expansion unit coupled to the digital host unit, and at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

As discussed with respect to claim 1 above, Graves does not teach or suggest a digital radio frequency transport system and a digital host unit that includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution. As discussed with respect to claims 11 and 12 above, Graves does not teach or suggest a digital expansion unit coupled to the digital host unit. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 14. Withdrawal of the rejection is respectfully requested.

Claims 15-21 (Original Claims 34-40) and Claims 22-24 (Original Claims 46-48) depend from and further define allowable claim 14 and for at least the reasons provided above are also allowable. In addition, since the Applicant believes the dependent claims are allowable for the above reasons, not all rejections of said claims may have been addressed in this response. Hence, Applicant retains the right to address said rejections if a further response is required. Therefore, reversal of the rejection of claims 15-24 is respectfully requested.

Claim 36 **(Original Claim 83)**

Claim 36 is directed to a digital radio frequency transport system. The system includes a digital host unit, wherein the digital host unit includes a channel summer, at least one digital expansion unit coupled to the digital host unit, and at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

As discussed with respect to claim 1 above, Graves does not teach or suggest a digital radio frequency transport system having a digital host unit that includes shared circuitry that performs bidirectional simultaneous digital radio frequency distribution. As discussed with respect to claim 11 above, Graves does not teach or discuss a digital expansion unit. In addition, Graves does not teach or suggest "a digital host unit, wherein the digital host unit includes a channel summer" as found in Claim 36. There is no suggestion or motivation, either in the cited references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Graves or to combine the reference teachings. There is no discussion of a channel summer in any of the cited references. The cited references alone or in combination do not teach or suggest the system of Claim 36. As a result, Examiner has failed to establish a prima facie case of obviousness with respect to claim 36 and claim 26 should be allowed.

Claims 2-7 (Original Claims 2-7), Claims 15-17 (Original Claims 34-36), Claims 22-23 (Original Claims 46-47), Claims 25-35 (Original Claims 57-67) are rejected under 35 USC § 103(a) as being unpatentable by Graves in view of Kallander et al (US Patent Number 5,603,080) and Schalamon (DE Pub. Number 3707244).

Claims 2-7 depend from and further define allowable claim 1 and for at least the reasons stated above are also allowable. In addition, since the Applicant believes the dependent claims are allowable for the above reasons, not all rejections of said claims may have been addressed in this response. Hence, Applicant retains the right to address said rejections if a further response is required. Therefore, the allowance of claims 2-7 is respectfully requested.

Claims 15-17, 22 and 23 depend from and further define allowable claim 14 and for at least the reasons stated above are also allowable. In addition, since the Applicant believes the dependent claims are allowable for the above reasons, not all rejections of said claims may have been addressed in this response. Hence, Applicant retains the right to address said rejections if a further response is required. Therefore, the allowance of claims 15-17, 22 and 23 is respectfully requested.

Claim 2 **(Original Claim 2)**

As mentioned above, Claim 2 depends from and further defines allowable Claim 1 and for at least the reasons provided above is also allowable. As discussed above, Graves does not teach or suggest the system of claim 1. In addition, the Examiner correctly states that Graves does not disclose a wireless interface coupled to a digital host unit as found in claim 2. Applicant respectfully traverses the Examiner's assertion that Graves discloses all of the claimed limitations of claim 2 except for a wireless interface coupled to the HDT. The Examiner states that "since Graves discloses transceivers 21 that interface with a core network, and since utilizing a wireless network for communication is well known, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Graves to couple transceivers 21 to a wireless cellular network (i.e, base stations) as disclosed by Kallander in Fig. 4a. By doing so, it is clear that the HDT would obviously comprise an A/D converter as shown in Schalamon (see Abstract, Fig.1) in order to sample RF analog signals from the wireless base station and provide digitized data to the digital switch matrix in Graves. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Graves, Schalamon and Kallander, for providing an wireless interface as claimed by replacing the core network with a wireless communication network, for providing an improved access system to wireless users."

First, Graves, Schalamon and Kallander alone or in combination do not teach or suggest all the claim limitations. Second, the teaching or suggestion to make the claimed combination and the reasonable expectation of success is also not found in the prior art; instead, it is based on applicant's disclosure. As a result, Examiner has failed to establish a prima facie case of obviousness with respect to claim 2. Thus, claim 2 is allowable and the withdrawal of the rejection is respectfully requested.

Claim 25 (Original Claim 57)

Claim 25 is directed to a method of performing multipoint-to-point digital radio frequency transport. The method includes receiving analog radio frequency signals at multiple digital remote units, converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units and optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit. The method further includes

receiving the multiple digital radio frequency signals at the digital host unit, summing the multiple digital radio frequency signals together, and converting the digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

Graves alone or in combination with Kallendar and/or Schalamon do not teach or suggest the method of claim 25. In particular, the references alone or in combination do not teach or suggest performing multipoint-to-point digital radio frequency transport. The Examiner refers to rejections with respect to claims 4 and 6 and further states "wherein it would have been obvious that the reverse path is just a reverse direction of the forward path as outlined in claims 4, 6 above." Applicant respectfully traverses these assertions. The Examiner provides no basis for these assertions.

First none of the references teach or suggest a method of performing multipoint-to-point digital radio frequency transport. Further, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Graves with Kallendar or Schalamon or to combine reference teachings. In addition, none of the references alone or in combination teach or suggest converting analog RF signals to digital RF signals at each or the digital remote units, optically transmitting the digital RF signals from each of the digital remote units to a digital host unit, summing the multiple digital RF signals together and/or converting the digital RF signals back to analog RF and transmitting the signals to a wireless interface device as found in claim 25. Further, there is no reasonable expectation of success in combining the references. Finally, the cited references alone or in combination do not teach or suggest all the claim limitations. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 25 and claim 25 should be allowed.

Claims 26 and 27 depend from and further define allowable claim 25 and for at least the reasons provided above, should also be allowed.

Claim 28

Claim 28 is directed to a method of performing point-to-multipoint digital radio frequency transport. The method includes receiving radio frequency signals at a digital host unit,

converting the radio frequency signals to a digitized radio frequency spectrum, and optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units. The method further includes receiving the digitized radio frequency spectrum at the plurality of digital remote units, converting the digitized radio frequency spectrum to analog radio frequency signals, and transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

Graves alone or in combination with Kallendar and/or Schalamon does not teach or suggest the method of claim 28. In particular, the references alone or in combination do not teach or suggest performing point to multipoint digital radio frequency transport. The Examiner relies on the same rejections provided with respect to claim 25 above. Applicant finds that the cited references alone or in combination do not teach or suggest converting RF signals to a digitized RF spectrum, optically transmitting the digitized RF spectrum to a plurality of digital remote units, converting the digitized RF spectrum to analog RF signals and transmitting the analog RF signals via a main RF antenna at each of the plurality of digital remote units as found in claim 28. There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Graves with Kallendar or Schalamon or to combine reference teachings. In addition, there is no reasonable expectation of success in combining the references. Finally, the cited references alone or in combination do not teach or suggest all the claim limitations. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 28 and claim 28 should be allowed.

Claims 29-32 depend from and further define allowable claim 28 and for at least the reasons provided above, should also be allowed.

Claim 33

Claim 33 is directed to a method of performing point-to-multipoint digital radio frequency transport. The method includes receiving radio frequency signals at a digital host unit, converting the radio frequency signals to a digitized radio frequency spectrum, optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit, and receiving the digitized radio frequency spectrum at

the first plurality of digital remote units. The method further includes converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units, receiving the digital radio frequency signals at the at least one digital expansion unit, and optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units. In addition, the method further includes receiving the second digitized radio frequency spectrum at the second plurality of digital remote units, converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units, and transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

Graves alone or in combination with Kallendar and/or Schalamon does not teach or suggest the method of claim 33. In particular, the references alone or in combination do not teach or suggest performing point to multipoint digital radio frequency transport.
The Examiner relies on rejections presented with respect to claims 5, 6 and 11 above and further states "that Graves as modified with a repeater or digital expansion unit (see claim 11) and a wireless network (see claims 5-6) would disclose such steps as recited in claim 33. Applicant respectfully traverses this rejection and finds that the Examiner has provided no basis for the assertions. In particular, none of the cited references alone or in combination teach or suggest the method of claim 33. For example, the references do not teach or suggest converting RF signals to a digitized radio frequency spectrum, optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit, and receiving the digitized radio frequency spectrum at the first plurality of digital remote units as found in claim 33. Further the references do not teach or suggest transmitting the analog RF signals via a main radio frequency antenna. In contrast, Shalamon discusses "Amplitude modulated short, medium and long wave **broadcasts** are first converted into FM signals, then converted into sound baseband signals" (See. Abstract).

There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Graves with Kallendar or Schalamon or to combine reference teachings. In addition, there is no reasonable expectation of success in combining the references. Finally, the cited references alone or in

combination do not teach or suggest all the claim limitations. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 33 and claim 33 should be allowed.

Claim 34 (**Original Claim 66**)

Claim 34 is directed to a digital radio frequency transport system. The system includes a digital host unit and at least two digital remote units coupled to the digital host unit. The at least two digital remote units each include a main radio frequency antenna, a duplexer coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path, a radio frequency to digital converter coupled to the duplexer in the reverse path, and a digital to radio frequency converter coupled to the duplexer in the forward path. The remotes units each further include a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path, an optical transmitter coupled to an output of the multiplexer chip set, and an optical receiver coupled to an input of the multiplexer chip set. The digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

The Examiner refers to the rejection with respect to claim 2 above which in turn refers to the rejection with respect to claim 1 above. As discussed with respect to claims 1 and 2 Graves alone or in combination with the other cited references does not teach or suggest a digital radio frequency transport system. Further, as discussed above with respect to claim 1 Graves does not teach or suggest a system including a digital host unit having shared circuitry that performs bi-directional simultaneous digital radio frequency distribution.

The Examiner states that "in addition, it would have been obvious to one of ordinary skill in the art that Graves as modified would disclose an A/D converter and a duplexer coupled to an antenna as claimed, in order to transmit/receive analog RF signals to/from the subscriber and convert it to digital for transmitting the HDT."

There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Graves with Kallendar or Schalamon or to combine reference teachings. In addition, there is no reasonable

expectation of success in combining the references. Finally, the cited references alone or in combination do not teach or suggest all the claim limitations. As a result, the Examiner has failed to establish a prima facie case of obviousness with respect to claim 34 and claim 34 should be allowed.

Claim 35 (**Original Claim 67**)

Claim 35 depends from and further defines allowable claim 34, and for at least the reasons provided above is also allowable. In addition, since the Applicant believes the dependent claim is allowable for the above reasons, not all rejections of said claim may have been addressed in this response. Hence, Applicant retains the right to address said rejections if a further response is required.

CONCLUSION

Applicant respectfully submits that claims 1-36 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at (612) 332-4720.

Respectfully submitted,

Date: 3/10/2004

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant(s): Wala

Docket No.: 100.019US02

Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT

MAIL STOP PATENT APPLICATION
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

We are transmitting herewith the following attached items and information (as indicated with an "X"):
X **CONTINUATION** of prior Patent Application No. 09/619,431, filed July 19, 2000, (under 37 C.F.R. § 1.53(b)) comprising:
X Specification (25 pgs. including 36 claims and 1 pg Abstract).
X Formal Drawings (8 sheets).
X Information Disclosure Statement (1 pg.) and Form 1449 (2 pgs.).
X An ADS document (7 pgs.).
X Copy of signed Declaration and Power of Attorney (2 pgs.) from prior application.
X Incorporation by Reference: *The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied herewith, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.*
X Prior Application is assigned of record to ADC Telecommunications, Inc. .
X A check in the amount of $1402.00 to cover the filing fee as calculated below.
X Return postcard.

The filing fee has been calculated below as follows:

APPLICATION FILING FEE					
	Number of Claims Filed (1)	Claims Included in Basic Filing Fee (2)	Number of Extra Claims (1-2)	Cost per Extra Claim	Fee Required
Total Claims	36	- 20 =	16	x $18 =	$288.00
Independent Claims	7	- 3 =	4	x $86 =	$344.00
				One or More Multiple Dependent Claims Presented	$ 0
				Basic Filing Fee	$ 770.00
				Total Application Filing Fee	**$1,402.00**

Please charge any additional required fees or credit overpayment to Deposit Account No. 502432.

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"Express Mail" mailing label number: EV385201202US **Date of Deposit: December 19, 2003**
These papers and fees are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated above and addressed to the Commissioner for Patents, Mail Stop Patent Application, P.O. Box 1450, Alexandria, VA 22313-1450.

(LARGE ENTITY TRANSMITTAL UNDER 37 C.F.R. 1.10)

POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT

Cross Reference to Related Applications

[0001] This application is a continuation of U.S. Application Serial No. 09/619,431, filed July 19, 2000, entitled "POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT", which is incorporated herein by reference.

Technical Field

[0002] The present invention is related to high capacity mobile communications systems, and more particularly to a point-to-multipoint digital micro-cellular communication system.

Background Information

[0003] With the widespread use of wireless technologies additional signal coverage is needed in urban as well as suburban areas. One obstacle to providing full coverage in these areas is steel frame buildings. Inside these tall shiny buildings (TSBs), signals transmitted from wireless base stations attenuate dramatically and thus significantly impact the ability to communicate with wireless telephones located in the buildings. In some buildings, very low power ceiling mounted transmitters are mounted in hallways and conference rooms within the building to distribute signals throughout the building. Signals are typically fed from a single point and then split in order to feed the signals to different points in the building.

[0004] In order to provide coverage a single radio frequency (RF) source needs to simultaneously feeds multiple antenna units, each providing coverage to a different part of a building for example. Simultaneous bi-directional RF distribution often involves splitting signals in the forward path (toward the antennas) and combining signals in the reverse path (from the antennas). Currently this can be performed directly at RF frequencies using passive splitters and combiners to feed a coaxial cable distribution network. In passive RF distribution systems, signal splitting in the forward path is significantly limited due to inherent insertion loss associated with the passive devices.

Each split reduces the level of the signal distributed in the building thereby making reception, e.g. by cell phones, more difficult. In addition, the high insertion loss of coaxial cable at RF frequencies severely limits the maximum distance over which RF signals can be distributed. Further, the system lacks any means to compensate for variations of insertion loss in each path.

[0005] Another solution to distributing RF signals in TSBs is taking the RF signal from a booster or base station, down converting it to a lower frequency, and distributing it via Cat 5 (LAN) or coaxial cable wiring to remote antenna units. At the remote antenna units, the signal is up converted and transmitted. While down-conversion reduces insertion loss, the signals are still susceptible to noise and limited dynamic range. Also, each path in the distribution network requires individual gain adjustment to compensate for the insertion loss in that path.

[0006] In another approach, fiber optic cables are used to distribute signals to antennas inside of a building. In this approach, RF signals are received from a bi-directional amplifier or base station. The RF signals directly modulate an optical signal, which is transported throughout the building as analog modulated light signals over fiber optic cable. Unfortunately, conventional systems using analog optical modulation transmission over optical fibers require highly sophisticated linear lasers to achieve adequate performance. Also, analog optical systems are limited in the distance signals can be transmitted in the building. Typically, this limitation is made worse due to the use of multimode fiber that is conventionally available in buildings. Multimode fiber is wider than single mode fiber and supports a number of different reflection modes so that signals tend to exhibit dispersion at the terminating end of the fiber. In addition, analog installation typically includes significant balancing when setting up the system. Further, RF levels in the system need to be balanced with the optical levels. If there is optical attenuation, the RF levels need to be readjusted. In addition, if the connectors are not well cleaned or properly secured, the RF levels can change.

[0007] Digitization of the RF spectrum prior to transport solves many of these problems. The level and dynamic range of digitally transported RF remains unaffected over a wide range of path loss. This allows for much greater distances to be covered, and eliminates the path loss compensation problem. However, this has been strictly a

point-to-point architecture. One drawback with digitally transported RF in a point-to-point architecture is the equipment and cost requirement. A host RF to digital interface device is needed for each remote antenna unit. In particular, for use within a building or building complex the number of RF to digital interface devices and the fiber to connect these devices is burdensome. For example, in a building having 20 floors, the requirement may include 20 host RF to digital interface devices for 20 remote antenna units, 1 per floor. In some applications more than one remote antenna unit per floor may be required. As a result, there is a need in the art for improved techniques for distributing RF signals in TSBs, which would incorporate the benefits of digital RF transport into a point-to-multipoint architecture.

Summary of the Invention

[0008] The above-mentioned problems with distributing RF signals within a building and other problems are addressed by the present invention and will be understood by reading and studying the following specification.

[0009] In one embodiment, a digital radio frequency transport system is provided. The transport system includes a digital host unit and at least two digital remote units coupled to the digital host unit. The digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

[0010] In another embodiment, a digital radio frequency transport system is provided. The transport system includes a digital host unit and at least one digital expansion unit coupled to the digital host unit. The transport system further includes at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit. The digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

[0011] In an alternate embodiment, a method of performing point-to-multipoint radio frequency transport is provided. The method includes receiving radio frequency signals at a digital host unit and converting the radio frequency signals to a digitized radio frequency spectrum. The method also includes optically transmitting the digitized radio

frequency spectrum to a plurality of digital remote units. The method further includes receiving the digitized radio frequency spectrum at the plurality of digital remote units, converting the digitized radio frequency spectrum to analog radio frequency signals and transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

Brief Description of the Drawings

[0012] Figure 1 is an illustration of one embodiment of a point-to-multipoint communication system according to the teachings of the present invention.

[0013] Figure 2 is a block diagram of one embodiment of a communication system according to the teachings of the present invention.

[0014] Figure 3 is a block diagram of another embodiment of a communication system according to the teachings of the present invention.

[0015] Figure 4 is a block diagram of one embodiment of a digital host unit according to the teachings of the present invention.

[0016] Figure 5 is a block diagram of one embodiment of a digital remote unit according to the teachings of the present invention.

[0017] Figure 6 is a block diagram of one embodiment of a digital expansion unit according to the teachings of the present invention.

[0018] Figure 7 is a block diagram of one embodiment of a microcell base station according to the teachings of the present invention.

[0019] Figure 8 is an illustration of one embodiment of an overflow algorithm for a channel summer according to the teachings of the present invention.

Detailed Description

[0020] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

[0021] Figure 1 is an illustration of one exemplary embodiment of a point-to-multipoint digital transport system shown generally at 100 and constructed according to the teachings of the present invention. The point-to-multipoint digital transport system 100 is shown distributed within a complex of tall shiny buildings (TSBs) 2. Although system 100 is shown in a complex of TSBs 2, it is understood that system 100 is not limited to this embodiment. Rather, system 100 in other embodiments is used to distribute signals in a single building, or other appropriate structure or indoor or outdoor location that exhibits high attenuation to RF signals. Advantageously, system 100 uses digital summing of digitized RF signals from multiple antennas to improve signal coverage in structures, such as TSBs.

[0022] Point-to-multipoint digital transport of RF signals is accomplished through a network of remote antenna units or digital remote units 40 and 40' and a digital host unit 20, which interfaces with a wireless network 5 which is coupled to the public switched telephone network (PSTN), or a mobile telecommunications switching office (MTSO) or other switching office/network. System 100 operates by transporting RF signals digitally over fiber optic cables. Signals received at DHU 20 are distributed to multiple DRUs 40 and 40' to provide coverage throughout a building complex. In addition, signals received at each of the DRUs 40 and 40' are summed together at the DHU 20 for interface to a wireless network.

[0023] In one embodiment, digital expansion unit DEU 30 is situated between the DHU 20 and one or more DRUs. In the forward path, DEU 30 expands the coverage area by splitting signals received from DHU 20 to a plurality of DRUs 40'. In the reverse path, DEU 30 receives signals from a plurality of DRUs 40', digitally sums the signals

together and transports them to a DHU 20 or another DEU such as 30. This system allows for successive branching of signals using DEUs 30 and expanded coverage to multiple DRUs 40 and 40'. This system provides an efficient way of providing signal coverage for wireless communication without added attenuation loss and distance constraint found with analog systems. By using DEUs 30, antennas can be placed further from DHU 20 without adversely affecting signal strength since shorter fiber optic cables can be used.

[0024] Digital transport system 100 includes a wireless interface device (WID) 10 that provides an interface to a wireless network. In one embodiment, the WID 10 includes either conventional transmitters and receivers or all digital transmitter and receiver equipment, and interface circuitry to a mobile telecommunications switching office (MTSO). In one embodiment, the wireless interface device 10 is coupled to an MTSO via a T1 line and receives and transmits signals between the MTSO and the DHU 20. In another embodiment, the wireless interface device 10 is coupled to the public switched telephone network (PSTN). In one embodiment, WID 10 comprises a base station and connects directly to DHU 20 via coaxial cables. In another embodiment, WID 10 comprises a base station and wirelessly connects to DHU 20 via a bi-directional amplifier that is connected to an antenna. In one embodiment, the antenna is an outdoor antenna.

[0025] WID 10 communicates signals between wireless units and the wireless network via digital remote units DRUs 40 and 40'. WID 10 is coupled to DHU 20. The DHU 20 is coupled to at least one digital expansion unit DEU 30 and a plurality of DRUs 40. In addition, DEU 30 is coupled to a plurality of DRUs 40'. The DHU 20 receives RF signals from WID 10 and converts the RF signals to digital RF signals. DHU 20 further optically transmits the digital RF signals to multiple DRUs 40 either directly or via one or more DEUs 30.

[0026] Each DRU 40 and 40' is connected through a fiber optic cable (or optionally another high bandwidth carrier) to transport digital RF signals to one of DHU 20 or DEU 30. In one embodiment, the fiber optic cable comprises multimode fiber pairs coupled between the DRUs 40 and the DHU 20, between the DRUs 40 and 40' and the DEUs 30 and between the DEUs 30 and the DHU 20. In one embodiment, the DEU 30

is coupled to the DHU 20 via single mode fiber and the DEU 30 is coupled to the DRUs 40' via multimode fiber pairs. Although, transport system 100 has been described with fiber optic cable other carriers may be used, e.g., coaxial cable.

[0027] In another embodiment, the DHU 20 is coupled to the DRUs 40 by a direct current power cable in order to provide power to each DRU 40. In one embodiment, the direct current power cable delivers 48 VDC to each DRU 40 connected to the DHU 20. In another embodiment, the DEU 30 is coupled to DRUs 40' by a direct current power cable to provide power to each DRU 40'. In one embodiment, the direct current power cable delivers 48 VDC to each DRU 40' connected to the DEU 30. In an alternate embodiment, DRUs 40 and 40' are connected directly to a power supply. In one embodiment, the power supply provides DC power to the DRUs 40 and 40'. In an alternate embodiment, the power supply provides AC power to the DRUs 40 and 40'. In one embodiment, DRUs 40 and 40' each include an AC/DC power converter.

[0028] Both DHU 20 and DEU 30 split signals in the forward path and sum signals in the reverse path. In order to accurately sum the digital signals together at DHU 20 or DEU 30 the data needs to come in to the DHU 20 or DEU 30 at exactly the same rate. As a result all of the DRUs 40 and 40' need to be synchronized so that their digital sample rates are all locked together. Synchronizing the signals in time is accomplished by locking everything to the bit rate over the fiber. In one embodiment, the DHU 20 sends out a digital bit stream and the optical receiver at the DEU 30 or DRU 40 detects that bit stream and locks its clock to that bit stream. In one embodiment, this is being accomplished with a multiplexer chip set and local oscillators, as will be described below. Splitting and combining the signals in a digital state avoids the combining and splitting losses experienced with an analog system. In addition, transporting the digital signals over multimode fiber results in a low cost transport system that is not subject to much degradation.

[0029] The down-conversion and up-conversion of RF signals are implemented by mixing the signal with a local oscillator (LO) at both the DRUs and the DHU. In order for the original frequency of the RF signal to be restored, the signal must be up-converted with an LO that has exactly the same frequency as the LO that was used for down conversion. Any difference in LO frequencies will translate to an equivalent end-

to-end frequency offset. In the embodiments described, the down conversion and up conversion LOs are at locations remote from one another. Therefore, in one preferred embodiment, frequency coherence between the local and remote LO's is established as follows: at the DHU end, there is a 142 MHz reference oscillator which establishes the bit rate of 1.42 GHz over the fiber. This reference oscillator also generates a 17.75 MHz reference clock which serves as a reference to which LO's at the DHU are locked.

[0030] At each of the DRUs, there is another 17.75 MHz clock, which is recovered from the optical bit stream with the help of the clock and bit recovery circuits. Because this clock is recovered from the bit stream generated at the host, it is frequency coherent with the reference oscillator at the host. A reference 17.75 MHz clock is then generated to serve as a reference for the remote local oscillators. Because the remote recovered bit clock is frequency coherent with the host master clock, the host and remote reference clocks, and any LO's locked to them, are also frequency coherent, thus ensuring that DHU and DRU LO's are locked in frequency. It is understood that in other embodiments the bit rate over the fiber may vary and the frequency of the clocks will also vary.

[0031] Figure 2 is a block diagram of one embodiment of a communication system, shown generally at 200 and constructed according to the teachings of the present invention. In this embodiment, a digital host unit (DHU) 220 is coupled to a bi-directional amplifier (BDA) 211. The BDA 211 receives communication signals from a wireless interface device (WID) and transports the communication signals as RF signals to the DHU 220 and receives RF signals from DHU 220 and transmits the RF signals to the WID. The DHU 220 receives RF signals from the BDA 211 and digitizes the RF signals and optically transmits the digital RF signals to multiple DRUs via transmission lines 214-1 to 214-N. DHU 220 also receives digitized RF signals over transmission lines 216-1 to 216-N from a plurality of DRUs either directly or indirectly via DEUs, reconstructs the corresponding analog RF signals, and applies them to BDA 211. In one embodiment, DHU 220 receives signals directly from a plurality N of DRUs. The signals are digitally summed and then converted to analog signals and transmitted to BDA 211. In another embodiment, DHU 220 receives signals from one or more DEUs and one or more DRUs directly. Again, the signals are all digitally summed and then

converted to analog signals and transmitted to BDA 211. The signals received via transmission lines 216-1 to 216-N may be received directly from a DRU or signals that are received by a DEU and summed together and then transported via 216-1 to 216-N to DHU 220 for additional summing and conversion for transport to BDA 211. DEUs provide a way to expand the coverage area and digitally sum signals received from DRUs or other DEUs for transmission in the reverse path to other DEUs or DHU 220. In one embodiment, transmission lines 214-1 to 214-N and 216-1 to 216-N comprise multimode fiber pairs. In an alternate embodiment, each fiber pair is replaced by a single fiber, carrying bi-directional optical signals through the use of wavelength division multiplexing (WDM). In an alternate embodiment, transmission lines 214-1 to 214-N and 216-1 to 216-N comprise single mode fibers. In one embodiment, N is equal to six. In an alternate embodiment, the number of transmission lines in the forward path direction 214-1 to 214-N is not equal to the number of transmission lines in the reverse path direction 216-1 to 216-N.

[0032] Figure 3 is a block diagram of an alternate embodiment of a communication system shown generally at 300 and constructed according to the teachings of the present invention. Communication system 300 includes a base station 310 coupled to a DHU 320. Base station 310 includes conventional transmitters and receivers 323 and 328, respectively, and conventional radio controller or interface circuitry 322 to an MTSO or telephone switched network. DHU 320 is coupled to base station 310. DHU 320 is also coupled to transmission lines 314-1 to 314-M, which transmit in the forward path direction and transmission lines 316-1 to 316-M, which transmit in the reverse path direction.

[0033] DHU 320 essentially converts the RF spectrum to digital in the forward path and from digital to analog in the reverse path. In the forward path, DHU 320 receives the combined RF signal from transmitters 323, digitizes the combined signal and transmits it in digital format over fibers 314-1 to 314-M, which are connected directly to a plurality of DRUs or indirectly to one or more DRUs via one or more DEUs.

[0034] In one embodiment, DHU 320 receives signals directly from a plurality M of DRUs. The signals are digitally summed and then converted to analog signals and transmitted to base station 310. In another embodiment, DHU 320 receives signals

from one or more DEUs and one or more DRUs directly. Again, the signals are all digitally summed and then converted to analog signals and transmitted to base station 310. The signals received via transmission lines 316-1 to 316-M may be received directly from a DRU or signals that are received by a DEU and summed together and then transported via 316-1 to 316-M to DHU 320 for additional summing and conversion for transport to base station 210. DEUs provide a way to expand the coverage area by splitting signals in the forward path and digitally summing signals received from DRUs or other DEUs in the reverse path for transmission upstream to other DEUs or a DHU. In the reverse path, DHU 320 also receives digitized RF signals over fibers 316-1 to 316-M from a plurality of DRUs, either directly or indirectly via DEUs, reconstructs the corresponding analog RF signal, and applies it to receivers 328.

[0035] In one embodiment, transmission lines 314-1 to 314-M and 316-1 to 316-M comprise multimode fiber pairs. In an alternate embodiment, each fiber pair is replaced by a single fiber, carrying bi-directional optical signals through the use of wavelength division multiplexing (WDM). In an alternate embodiment, transmission lines 314-1 to 314-M and 316-1 to 316-M comprise single mode fibers. In one embodiment, M is equal to six. In an alternate embodiment, the number of transmission lines in the forward path direction 314-1 to 314-M is not equal to the number of transmission lines in the reverse path direction 316-1 to 316-M.

[0036] Referring now to FIG. 4, there is shown one embodiment of a DHU 420 constructed according to the teachings of the present invention. DHU 420 includes an RF to digital converter 491 receiving the combined RF signals from a wireless interface device such as a base station, BDA or the like. RF to digital converter 491 provides a digitized traffic stream that is transmitted to multiplexer 466. Multiplexer 466 converts the parallel output of the A/D converter into a framed serial bit stream. At the output of the multiplexer is a 1 to P fan out buffer 407, which splits the digital signal P ways. There are P optical transmitters 431-1 to 431-P one feeding each of the P optical transmission lines 414-1 to 414-P. The digitized signals are applied to fibers 414-1 to 414-P for transmission to corresponding DRUs either directly or via DEUs. In one embodiment, P is equal to 6.

[0037] In one embodiment, DHU 420 includes an amplifier 450 that receives the combined RF signal from a wireless interface device such as a base station or BDA. The combined RF signal is amplified and then mixed by mixer 452 with a signal received from local oscillator 468. Local oscillator 468 is coupled to reference oscillator 415. In one embodiment the local oscillator is coupled to a frequency divider circuit 470, which is in turn coupled to reference oscillator 415. The local oscillator is locked to the reference oscillator 415 as a master clock so that the down conversion of the RF signals is the same as the up conversion. The result is end to end, from DHU to DRU, or DHU to one or more DEUs to DRU, no frequency shift in the signals received and transmitted. The local oscillator 463 is also coupled to a synthesizer circuit 476.

[0038] The output signal of mixer 452 is provided to amplifier 454 amplified and then filtered via intermediate frequency (IF) filter 456. The resultant signal is the combined RF signal converted down to an IF signal. The IF signal is mixed with another signal originating from the reference oscillator 415 via mixer 460. The output of mixer 460 is summed together at 462 with a signal produced by field programmable gate array (FPGA) 467. The output is then converted from an analog signal to a digital signal via analog/digital (A/D) converter 464 once converted the digital RF signal is applied to multiplexer 466. In one embodiment, the A/D converter 464 is a 14-bit converter handling a 14-bit signal. In other embodiments, the A/D converter 464 may be of any size to accommodate an appropriate signal. In one embodiment, the input signal from FPGA 467 is a dither signal from dither circuit 462 that adds limited out of band noise to improve the dynamic range of the RF signal.

[0039] In one embodiment, DHU 420 includes an alternating current to digital current power distribution circuit 6 that provides direct current power to each of the DRUs coupled to DHU 420.

[0040] DHU 420 further includes a plurality of digital optical receivers 418-1 to 418-P in the reverse path. Receivers 418-1 to 418-P each output an electronic digital signal, which is applied to clock and bit recovery circuits 445-1 to 445-P, respectively, for clock and bit recovery of the electronic signals. The signals are then applied to demultiplexers 441-1 to 441-P, respectively, which extract the digitized signals generated at the DRUs, as will be explained in detail below. Demultiplexers 441-1 to

441-P further extract alarm (monitoring) and voice information framed with the digitized signals. The digitized signals output at each demultiplexer 441-1 to 441-P are then applied to FPGA 467 where the signals are summed together and then applied to digital to RF converter 495. Converter 495 operates on the sum of the digitized signals extracted by demultiplexers 441-1 to 441-P, reconstructing baseband replicas of the RF signals received at all the digital remote units. The baseband replicas are then up-converted to their original radio frequency by mixing with a local oscillator 482 and filtering to remove image frequencies. Local oscillator 482 is coupled to synthesizer 476 and reference oscillator as discussed with respect to local oscillator 468 above.

[0041] In one embodiment, digital to RF converter 495 includes digital to analog (D/A) converter 484 coupled to an output of FPGA 467 the digitized RF signals are converted to analog RF signals and then mixed with a signal from reference oscillator 415 by mixer 492. The signal is then filtered by IF filter 490 and amplified by amplifier 488. The resultant signal is then mixed with a signal from local oscillator 482 and then applied to RF filter 484, amplifier 480 and RF filter 478 for transmission by a wireless interface device such as a BDA or base station.

[0042] In one embodiment, FPGA 467 includes an alarm/control circuit 474, which extracts overhead bits from DRUs to monitor error and alarm information. In one embodiment, the FPGA 467 includes a summer 498, which mathematically sums together the digital RF signals received from fibers 416-1 to 416-P. In another embodiment FPGA includes an overflow algorithm circuit 486 coupled to the output of summer 486. The algorithm circuit 496 allows the summed digital RF signals to saturate and keep the summed signal within a defined number of bits. In one embodiment, the algorithm circuit includes a limiter. In one embodiment, the RF signals are 14-bit signals and when summed and limited by summer 498 and overflow algorithm 496 result in a 14-bit output signal.

[0043] For example, in one embodiment each of the digital RF signals received from fibers 416-1 to 416-P, where P is equal to 6, comprise 14 bit inputs. All of those 6 different 14 bit inputs then go into summer 498. In order to allow for overflow, at least 17 bits of resolution is needed in the summer 498 to handle a worst-case scenario when all 6 of the 14 bit inputs are at full scale at the same time. In this embodiment, a 17-bit

wide summer 498 is employed to handle that dynamic range. Coming out of summer 498 is needed a 14-bit signal going in the reverse path. In one embodiment, an algorithm circuit 496 for managing the overflow is implemented. In one embodiment, the summer and 498 and overflow algorithm 496 are included in FPGA 467. In one embodiment, overflow algorithm 496 acts like a limiter and allows the sum to saturate and keeps the summed signal within 14 bits. In an alternate embodiment, overflow algorithm circuit 496 controls the gain and scales the signal dynamically to handle overflow conditions.

[0044] Figure 8 illustrates one embodiment of an algorithm 863 for a channel summer 865 in order to limit the sum of input signals 0 to 5 to 14 bits. In this embodiment, input signals 0 to 5 comprise 6 signals that are summed together by summer 865. The sum of input signals 0 to 5 is reduced to a signal having 14 bits or less by the algorithm 863. It is understood that the algorithm 865 is by example and is not meant to restrict the type of algorithm used to limit the sum of signals 0 to 5 to 14 bits or less.

[0045] For example, when the sum of the 6 input signals 0 to 5 is greater than or equal to 13FFBh then the sum is divided by 6 for a signal that is 14 bits or less. When the sum of the 6 input signals 0 to 5 is greater than 13FFBh but less than or equal to FFFCh then the sum is divided by 5 for a signal that is 14 bits or less. When the sum of the 6 input signals 0 to 5 is greater than FFFCh but less than BFFDh then the sum is divided by 4 for a signal that is 14 bits or less. When the sum of the 6 input signals 0 to 5 is greater BFFDh but less than 7FFEh then the sum is divided by 3 for a signal that is 14 bits or less. Finally, when the sum of the 6 input signals 0 to 5 is greater than 7FFEh but less than or equal to 3FFFh then the sum is divided by 2 for a signal that is 14 bits or less.

[0046] Figure 5 is a block diagram of one embodiment of a digital remote unit (DRU) 540 constructed according to the teachings of the present invention. A digital optical receiver 501 receives the optical digital data stream transmitted from a DHU directly or via a DEU. Receiver 501 converts the optical data stream to a corresponding series of electrical pulses. The electrical pulses are applied to clock and bit recovery circuit 503. The series of electrical pulses are then applied to demultiplexer 505. Demultiplexer 505 extracts the digitized traffic signals and converts the signals from serial to parallel.. The

output parallel signal is then applied to digital to RF converter 595 for conversion to RF and transmission to duplexer 547. RF converter 595 is connected to the main antenna 599 through a duplexer 547. Accordingly, radio frequency signals originating from a wireless interface device are transmitted from main antenna 547.

[0047] In one embodiment, digital to RF converter 595 includes a digital-to-analog (D/A) converter 509, which reconstructs the analog RF signal and applies it to IF 504 and amplifier 506. The analog signal is mixed with an output signal of reference oscillator 515 by mixer 502. The output of amplifier 506 is mixed with a signal from local oscillator 519 that locks the RF signal with the return digital signal via reference oscillator 515 that is coupled to local oscillator 519. In one embodiment, the reference oscillator is coupled to frequency divider 517 that in turn is coupled to local oscillators 519 and 529. The local oscillators 519 and 529 are also coupled to synthesizer 521 that is coupled to programmable logic device 525.

[0048] RF signals received at main antenna 599 are passed through duplexer 547 to RF to digital converter 593. The RF signals are converted to digital signals and then applied to multiplexer 536 converted from parallel-to-serial and optically transmitted via optical transmitter 532 to a DEU or DHU.

[0049] In one embodiment, RF to digital converter 593 includes a first amplifier 543 that receives RF signals from duplexer 547, amplifies the signals and transmits them to digital attenuator 539. In one embodiment, amplifier 543 is a low noise amplifier. Digital attenuator 539 receives the amplified signals and digitally attenuates the signal to control the levels in case of an overload situation. RF to digital converter 593 further includes a second amplifier 537, which receives the attenuated signals, amplifies the signals and applies the amplified signals to mixer 535. Mixer 535 mixes the amplified signals with a signal received from local oscillator 529. The resultant signals are applied to a third amplifier 533 an IF filter 548 and a fourth amplifier 546 in series to down convert to an IF signal. The IF signal is then mixed with a signal from reference oscillator 515 and the mixed signal is summed with a signal from dither circuit 527. The resultant signal is applied to analog-to-digital converter 538 and converted to a digital signal. The output digital signal is then applied to a multiplexer 536. In one embodiment, the multiplexer 536 multiplexes the signal together with a couple of extra

bits to do framing and control information. In one embodiment, multiplexer 536, clock and bit recovery circuit and demultiplexer 505 comprise a multiplexer chip set.

[0050] Programmable logic circuit 525 programs synthesizer 521 for the reference oscillator and for the up and down conversion of local oscillators 519 and 529. The programmable logic circuit 525 looks for error conditions, for out of lock conditions on the oscillators and reports error modes and looks for overflow condition in the A/D converter 538. If an overflow condition occurs the programmable logic circuit 525 indicates that you are saturating and adds some extra attenuation at digital attenuator 539 in order to reduce the RF signal levels coming in from RF antenna 599 and protect the system from overload.

[0051] In one embodiment, DRU 540 includes an internal direct current power distribution system 5. In one embodiment, the distribution system receives 48 VDC and internally distributes 3 outputs of +3.8V, +5.5V and +8V.

[0052] Figure 6 is a block diagram of one embodiment of a digital expansion unit (DEU) 630 constructed according to the teachings of the present invention. DEU 630 is designed to receive optical signals and transmit optical signals. An optical receiver 651 receives digitized RF signals and transmits them to clock and bit recovery circuit 653 that performs clock and bit recovery to lock the local clock and clean up the signal. The signals are then split into X RF digital signals by 1 to X fan out buffer 607. The signals are then transmitted via optical transmitters 655-1 to 655-X to X receiving units such as DEUs or DRUs. The X receiving units may be any combination of DEUs or DRUs. In one embodiment, X is equal to six.

[0053] DEU 630 also includes optical receivers 669-1 to 669-X, which receive digitized RF signals directly from DRUs or indirectly via DEUs. In operation the signals are received, applied to clock and bit recovery circuits 673-1 to 673-X respectively to lock the local clock and clean up the signals and then applied to demultiplexers 671-1 to 671-X. Demultiplexers 671-1 to 671-X each extract the digitized traffic and apply the samples to field programmable gate array 661. The signals are summed together digitally and transmitted to multiplexer 657, which mulitplexes the signal together with a couple of extra bits to do framing and control information. In addition, the multiplexer 657 converts the signals parallel to serial. The signals are then applied to

optical transmitter 659 for further transmission. In one embodiment, the signals are directly transmitted to a DHU or indirectly via one or more additional DEUs.

[0054] In one embodiment, the FPGA 661 includes summer 665, which mathematically sums together the digital RF signals received from demultiplexers 671-1 to 671-X. In another embodiment, FPGA 661 includes an overflow algorithm circuit 663 coupled to the output of summer 665. The algorithm circuit 663 allows the summed digital RF signals to saturate and keep the summed signal within a defined number of bits. In one embodiment, the algorithm circuit includes a limiter. In one embodiment, the RF signals are 14-bit signals and when summed and limited by summer 665 and overflow algorithm 663 result in a 14-bit output signal.

[0055] In one embodiment, DEU 630 includes an alternating current to digital current power distribution circuit 7 that provides direct current power to each of the DRUs coupled to DEU 630.

[0056] In an alternate embodiment, the digital host unit (DHU) and wireless interface device (WID) are located some distance from the building being served. The DHU in the building is replaced by a DEU, and the link between that DEU and the remotely located DHU is via single mode fiber. Figure 7 is a block diagram of this embodiment. A microcell base station shown generally at 700 includes conventional transmitters and receivers 723 and 728, respectively, and conventional radio controller or interface circuitry 722. In the forward path, a DHU 767 receives the combined RF signal from transmitters 723, digitizes the combined signal and transmits it in digital format over single mode fiber to a DEU. In the reverse path, DHU 767 receives digitized RF signal from a DEU, reconstructs the corresponding analog RF signal, and applies it to receivers 728.

[0057] In another alternate embodiment, the wireless interface device (WID) is a software defined base station, and the interface between the DHU and WID takes place digitally, eliminating the need for the RF to digital conversion circuitry in the DHU.

Conclusion

[0058] A digital radio frequency transport system has been described. The transport system includes a digital host unit and at least two digital remote units coupled to the

digital host unit. The digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

[0059] In addition, a digital radio frequency transport system has been described. The transport system includes a digital host unit and at least one digital expansion unit coupled to the digital host unit. The transport system further includes at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit. The digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and that at least two digital remote units.

[0060] Further, a method of performing point-to-multipoint radio frequency transport has been described. The method includes receiving analog radio frequency signals at a digital host unit and converting the analog radio frequency signals to digitized radio frequency signals. The method also includes splitting the digitized radio frequency signals into a plurality of a digital radio frequency signals and optically transmitting the digital radio frequency signals to a plurality of digital remote units. The method further includes receiving the digital radio frequency signals at a plurality of digital remote units, converting the digital radio frequency signals to analog radio frequency signals and transmitting the signals via a main radio frequency antenna at each of the plurality of digital remote units.

[0061] Although specific embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that any arrangement which is calculated to achieve the same purpose may be substituted for the specific embodiments shown. For example, a digital remote unit is not limited to the receipt and summing and splitting and transmitting of digitized radio frequency signals. In other embodiments, the digital host unit is capable of receiving and summing analog radio frequency signals in addition to or instead of digitized radio frequency signals. As well, the digital host unit is capable of splitting and transmitting analog radio frequency signals in addition to or instead of digitized radio frequency signals. This application is intended to cover any adaptations or variations of the present invention. Therefore, it is intended that this invention be limited only by the claims and the equivalents thereof.

What is claimed is:

1. A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

2. The system of claim 1, further comprising a wireless interface device coupled to the digital host unit.

3. The system of claim 2, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

4. The system of claim 2, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via bi-directional amplifier that is coupled to an antenna.

5. The system of claim 1, wherein the at least two digital remote units each include a main radio frequency antenna which transmits and receives radio frequency signals.

6. The system of claim 1, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal.

7. The system of claim 6, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units.

8. The system of claim 1, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

9. The system of claim 1, wherein the digital host unit is coupled to each of the at least two digital remote units by a multimode fiber pair.

10. The system of claim 7, wherein the digital host unit further comprises an alarm/control interface circuit coupled to the multiplexer.

11. The system of claim 1, further comprising a digital expansion unit coupled to the digital host unit, wherein the digital expansion unit contains circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the digital remote unit.

12. The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by a multimode fiber pair.

13. The system of claim 11, wherein the digital expansion unit is coupled to the digital host unit by single mode fiber.

14. A digital radio frequency transport system, comprising:

a digital host unit;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units, each coupled to one of the digital host unit and the digital expansion unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

15. The system of claim 14, further comprising a wireless interface device coupled to the digital host unit.

16. The system of claim 15, wherein the wireless interface device comprises a base station that couples directly to the digital host unit via coaxial cables.

17. The system of claim 15, wherein the wireless interface device comprises a base station that wirelessly connects to the digital host unit via a bi-directional amplifier that is coupled to an antenna.

18. The system of claim 14, wherein at least one digital remote unit is to coupled the digital host unit.

19. The system of claim 14, wherein at least one digital remote unit is coupled to one of the at least two digital expansion units.

20. The system of claim 14, wherein the at least one digital expansion units are each coupled to the digital host unit via a multimode fiber pair.

21. The system of claim 14, wherein the at least one digital expansion unit is coupled to the digital host unit via a single mode fiber.

22. The system of claim 14, wherein the digital host unit includes a radio frequency to digital converter that converts a main radio frequency signal to a digitized radio frequency signal.

23. The system of claim 22, wherein the digital host unit further includes a multiplexer which splits the digitized radio frequency signal into at least two digital signals for optical transmission to the at least two digital remote units.

24. The system of claim 14, wherein the digital host unit includes local oscillators coupled to a reference oscillator for synchronization of the radio frequency signal in the forward direction and in the reverse direction.

25. A method of performing multipoint-to-point digital radio frequency transport, the method comprising:

receiving analog radio frequency signals at multiple digital remote units;

converting the analog radio frequency signals to digital radio frequency signals at each of the digital remote units;

optically transmitting the digital radio frequency signals from each of the digital remote units to a digital host unit;

receiving the multiple digital radio frequency signals at the digital host unit;

summing the multiple digital radio frequency signals together; and

converting the digital radio frequency signals back to analog radio frequency signals and transmitting the signals to a wireless interface device for further transmission to a switched telephone network.

26. The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises amplifying the analog radio frequency signals.

27. The method of claim 25, wherein converting the analog radio frequency signals to digital radio frequency signals comprises synchronizing a reverse path local oscillator to a mater clock so as to reduce end-to-end frequency translation.

28. A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting the digitized radio frequency spectrum to a plurality of digital remote units;

receiving the digitized radio frequency spectrum at the plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the plurality of digital remote units.

29. The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum comprises amplifying the radio frequency signals.

30. The method of claim 28, wherein converting the radio frequency signals to a digitized radio frequency spectrum digital radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

31. The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises amplifying the analog radio frequency signals.

32. The method of claim 28, wherein converting the digitized radio frequency spectrum to analog radio frequency signals comprises synchronizing a forward path local oscillator to a reference oscillator so as to reduce end-to-end frequency translation.

33. A method of performing point-to-multipoint digital radio frequency transport, the method comprising:

receiving radio frequency signals at a digital host unit;

converting the radio frequency signals to a digitized radio frequency spectrum;

optically transmitting a first digitized radio frequency spectrum to a first plurality of digital remote units and at least one digital expansion unit;

receiving the digitized radio frequency spectrum at the first plurality of digital remote units;

converting the digitized radio frequency spectrum to analog radio frequency signals at each of the first plurality of digital remote units;

receiving the digital radio frequency signals at the at least one digital expansion unit;

optically transmitting a second digitized radio frequency spectrum to a second plurality of digital remote units;

receiving the second digitized radio frequency spectrum at the second plurality of digital remote units;

converting the second digitized radio frequency spectrum to analog radio frequency signals at each of the second plurality of digital remote units; and

transmitting the analog radio frequency signals via a main radio frequency antenna at each of the first and second plurality of digital remote units.

34. A digital radio frequency transport system, comprising:

a digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the at least two digital remote units each include:

a main radio frequency antenna;

a duplexer coupled to the main radio frequency antenna which receives radio frequency signals in the reverse path and transmits radio frequency signals in the forward path;

a radio frequency to digital converter coupled to the duplexer in the reverse path;

a digital to radio frequency converter coupled to the duplexer in the forward path;

a multiplexer chip set coupled to the radio frequency to digital converter in the reverse path and the digital to radio frequency converter in the forward path;

an optical transmitter coupled to an output of the multiplexer chip set; and

an optical receiver coupled to an input of the multiplexer chip set;

wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

35. The system of claim 34, wherein the digital host unit includes an alarm/control interface circuit.

36. A digital radio frequency transport system, comprising:

a digital host unit, wherein the digital host unit includes a channel summer;

at least one digital expansion unit coupled to the digital host unit; and

at least two digital remote units coupled to the digital host unit, wherein the digital host unit includes shared circuitry that performs bi-directional simultaneous digital radio frequency distribution between the digital host unit and the at least two digital remote units.

Abstract of the Disclosure

A digital radio frequency transport system that performs bi-directional simultaneous digital radio frequency distribution is provided. The transport system includes a digital host unit and at least two digital remote units coupled to the digital host unit. The bi-directional simultaneous digital radio frequency distribution is performed between the digital host unit and the at least two digital remote units.

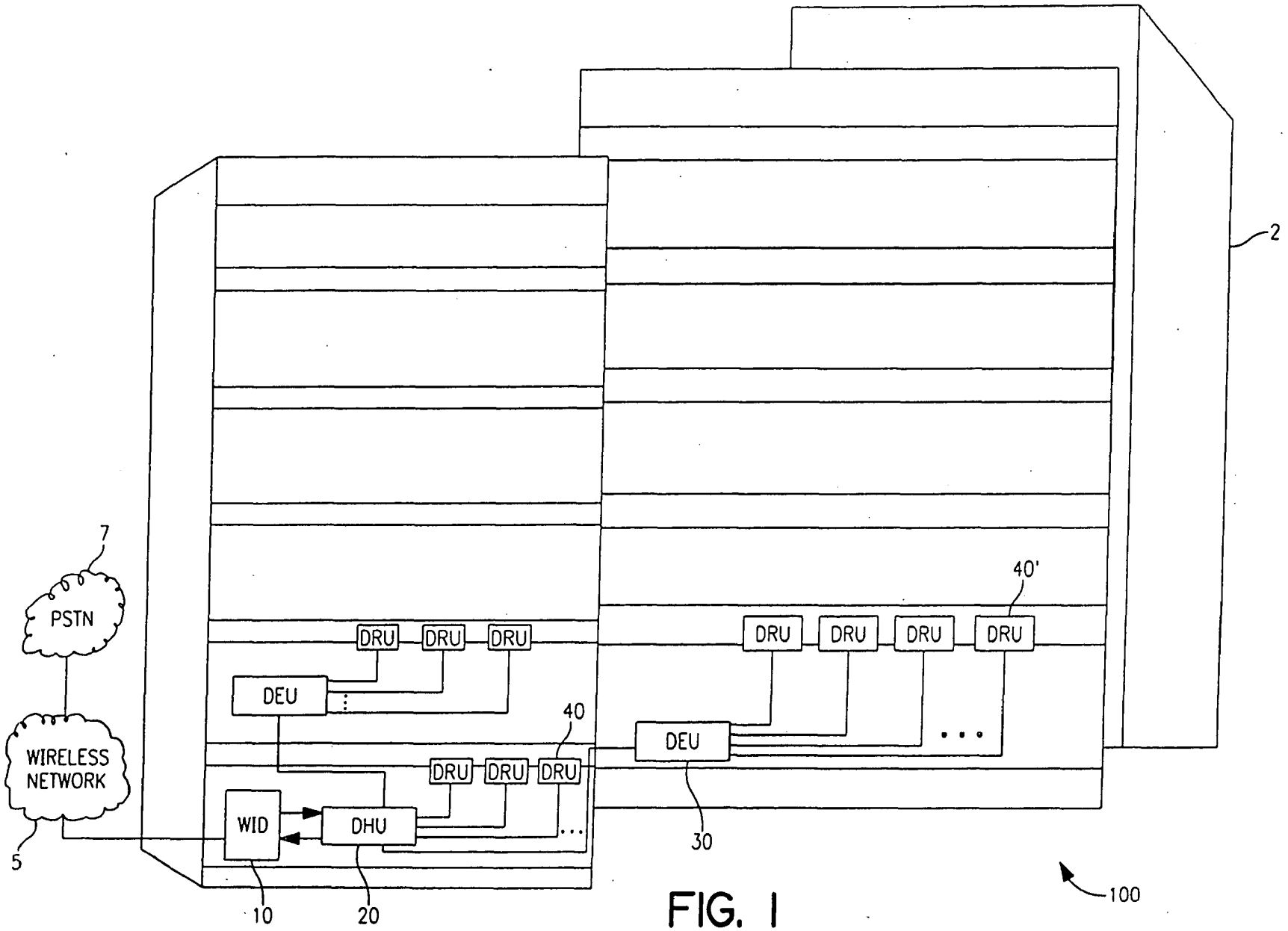

2
7
PSTN
WIRELESS NETWORK
5
DRU
DRU
DRU
DEU
40
DRU
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DHU
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DRU
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DEU
30
100

FIG. 1

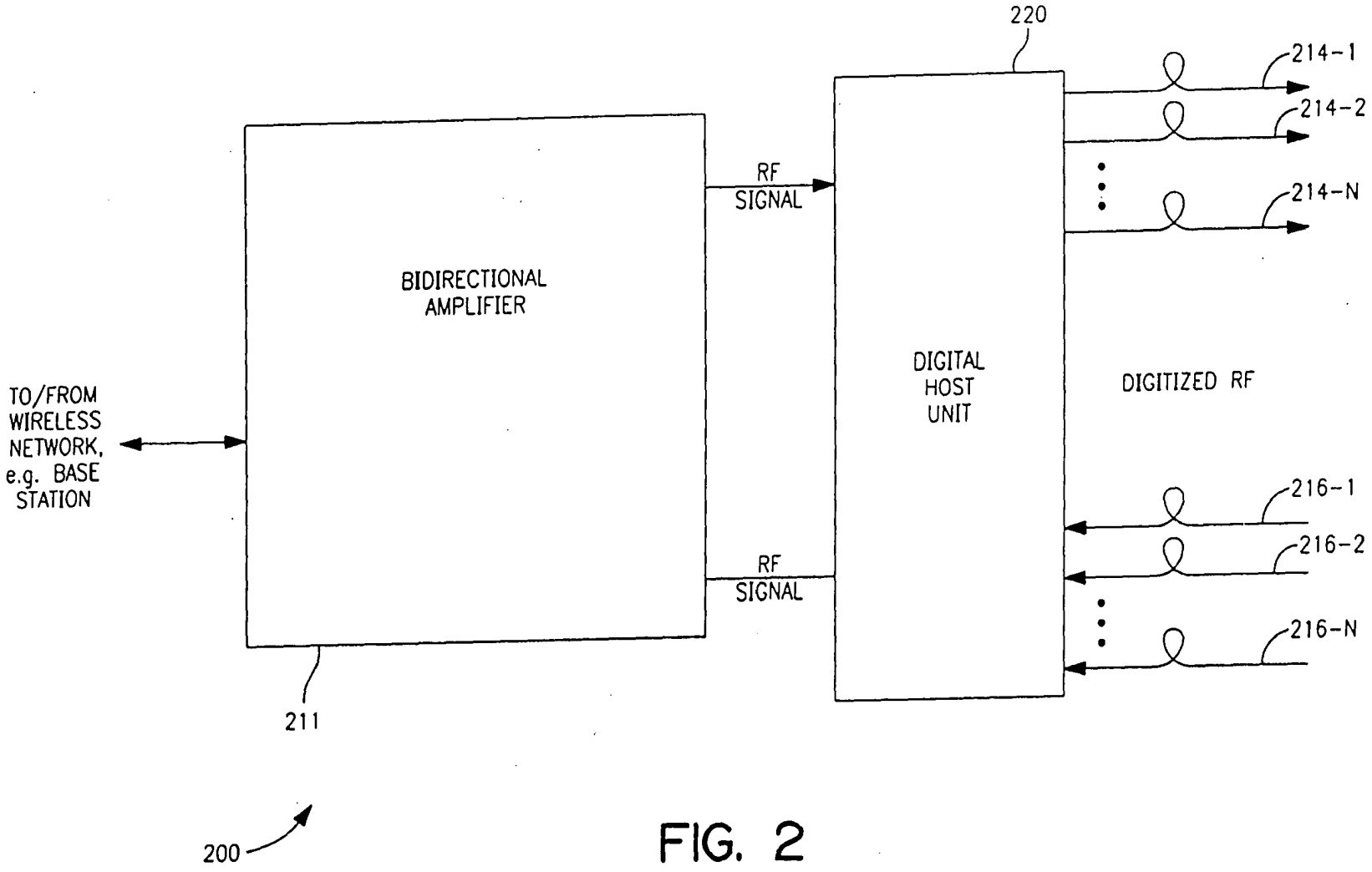

220
214-1
214-2
214-N
RF
SIGNAL
BIDIRECTIONAL
AMPLIFIER
DIGITAL
HOST
UNIT
DIGITIZED RF
TO/FROM
WIRELESS
NETWORK,
e.g. BASE
STATION
RF
SIGNAL
216-1
216-2
216-N
211
200

FIG. 2

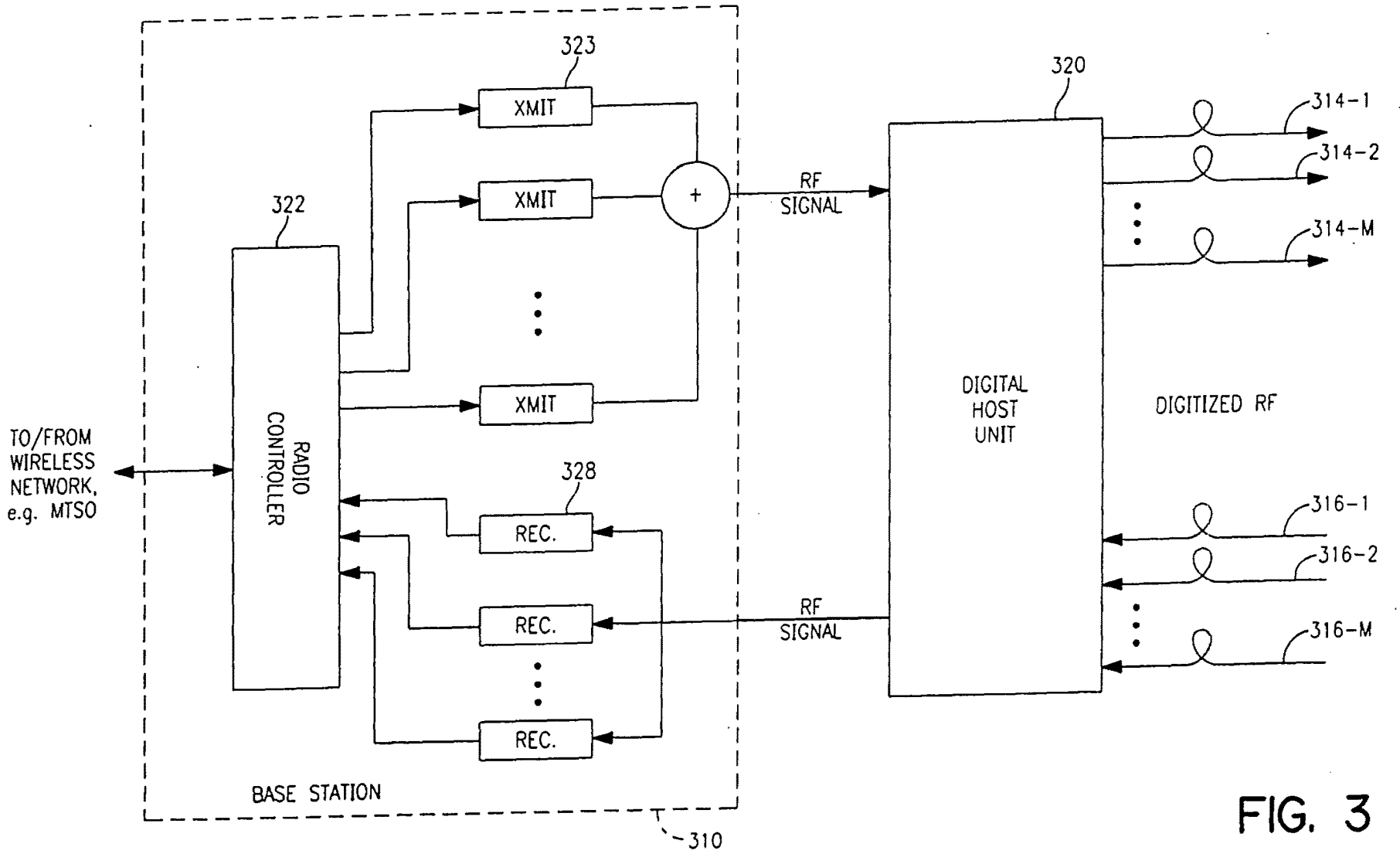

323
XMIT
XMIT
XMIT
322
RADIO CONTROLLER
TO/FROM WIRELESS NETWORK, e.g. MTSO
328
REC.
REC.
REC.
BASE STATION
310
+
RF SIGNAL
RF SIGNAL
320
DIGITAL HOST UNIT
DIGITIZED RF
314-1
314-2
314-M
316-1
316-2
316-M

FIG. 3

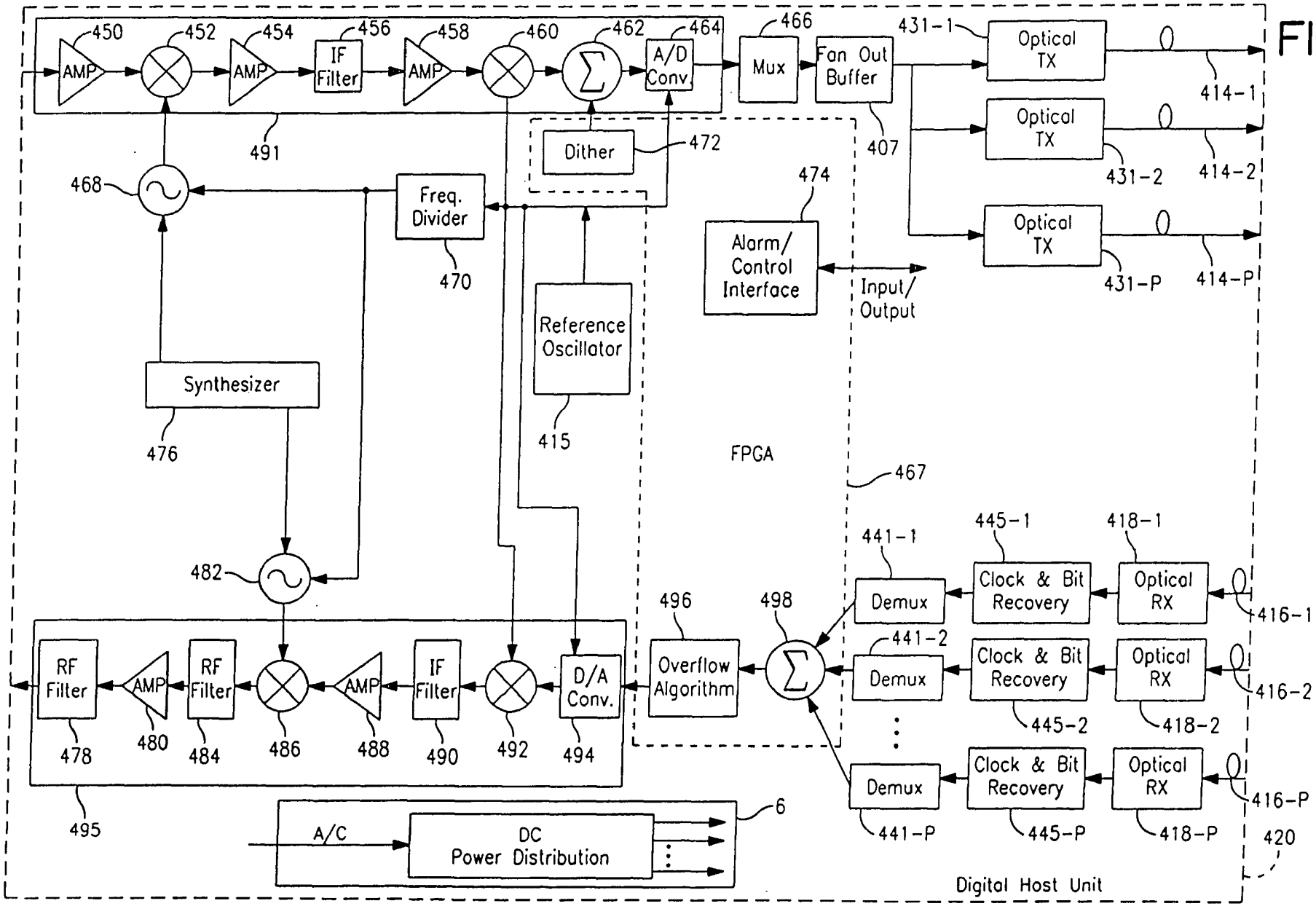

AMP
450
452
AMP
454
IF Filter
456
AMP
458
460
462
A/D Conv
464
466
Mux
Fan Out Buffer
407
431-1
Optical TX
414-1
Optical TX
431-2
414-2
Optical TX
431-P
414-P
491
Dither
472
468
Freq. Divider
470
474
Alarm/ Control Interface
Input/ Output
Reference Oscillator
415
Synthesizer
476
FPGA
467
482
496
498
441-1
Demux
445-1
Clock & Bit Recovery
418-1
Optical RX
416-1
441-2
Demux
Clock & Bit Recovery
445-2
Optical RX
418-2
416-2
Demux
441-P
Clock & Bit Recovery
445-P
Optical RX
418-P
416-P
420
RF Filter
478
AMP
480
RF Filter
484
486
AMP
488
IF Filter
490
492
D/A Conv.
494
Overflow Algorithm
495
A/C
DC Power Distribution
6
Digital Host Unit

FIG. 4

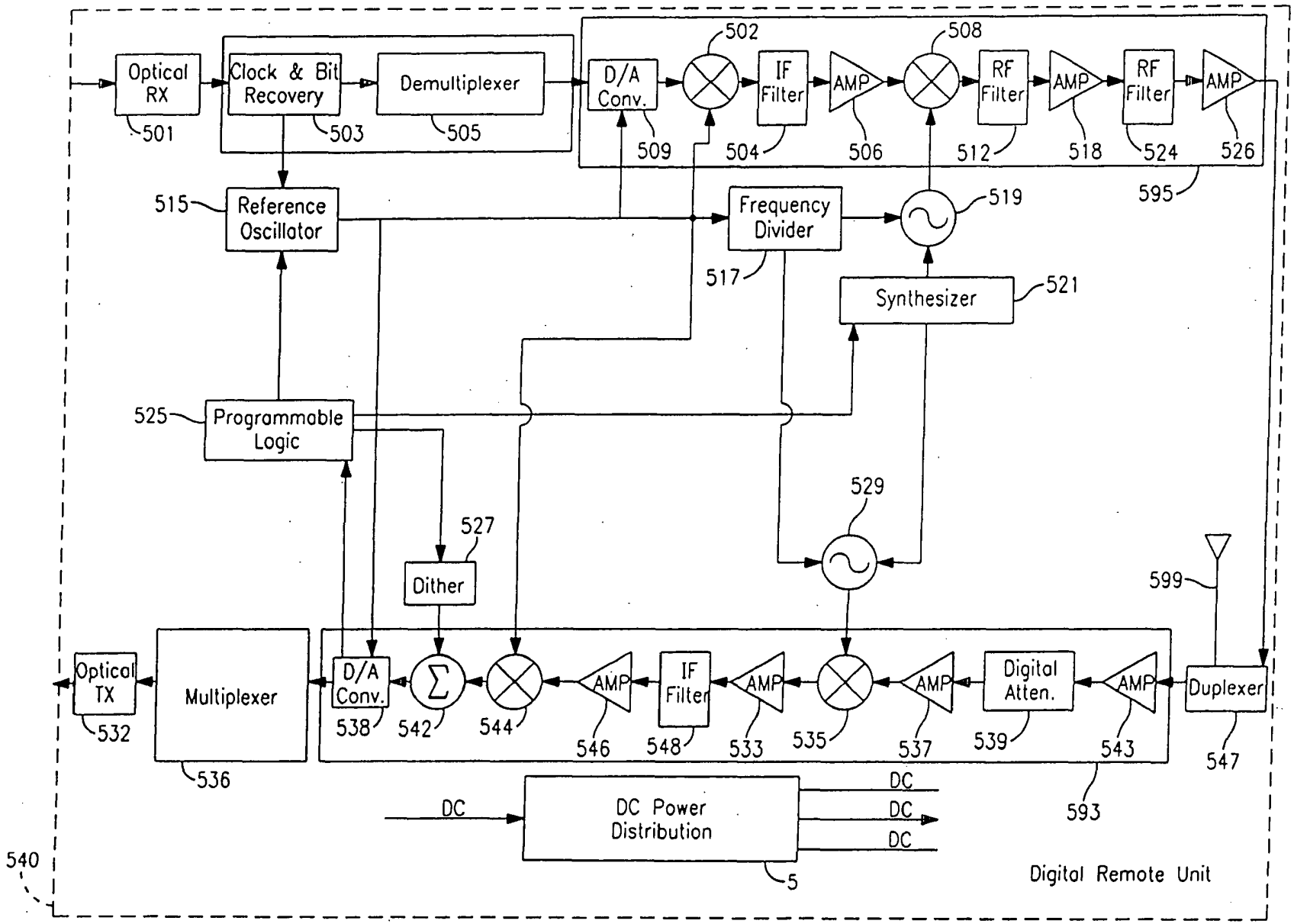

Optical RX
501
Clock & Bit Recovery
503
Demultiplexer
505
D/A Conv.
509
502
IF Filter
504
AMP
506
508
RF Filter
512
AMP
518
RF Filter
524
AMP
526
595
515
Reference Oscillator
Frequency Divider
517
519
Synthesizer
521
525
Programmable Logic
529
527
Dither
599
Optical TX
532
Multiplexer
536
D/A Conv.
538
542
544
AMP
546
IF Filter
548
AMP
533
AMP
535
AMP
537
Digital Atten.
539
AMP
543
Duplexer
547
DC
DC Power Distribution
DC
DC
DC
593
5
540
Digital Remote Unit

FIG. 5

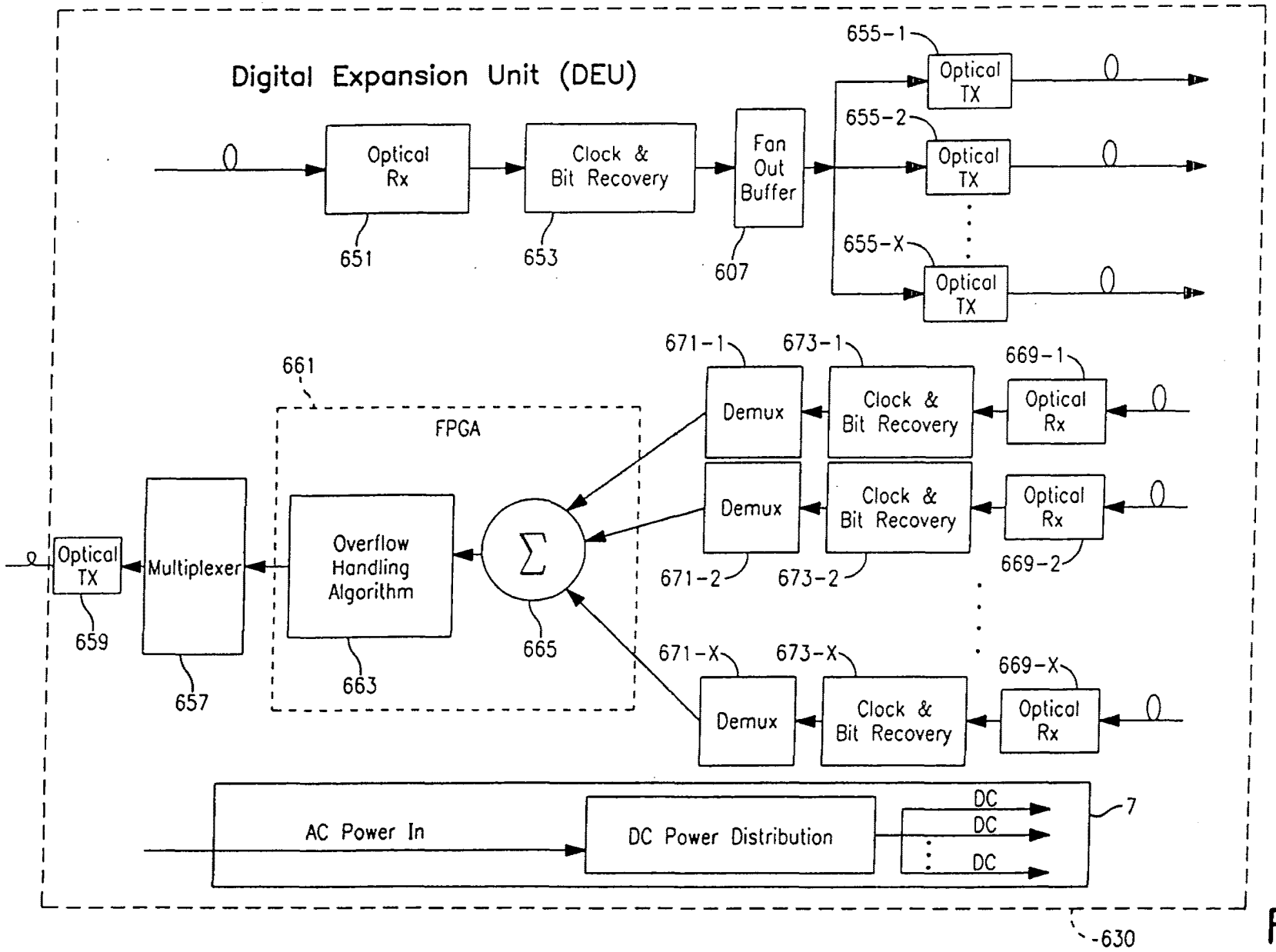

Digital Expansion Unit (DEU)
Optical Rx
651
Clock & Bit Recovery
653
Fan Out Buffer
607
655-1
Optical TX
655-2
Optical TX
655-X
Optical TX
661
FPGA
Overflow Handling Algorithm
663
Σ
665
Optical TX
659
Multiplexer
657
671-1
Demux
673-1
Clock & Bit Recovery
669-1
Optical Rx
671-2
Demux
673-2
Clock & Bit Recovery
669-2
Optical Rx
671-X
Demux
673-X
Clock & Bit Recovery
669-X
Optical Rx
AC Power In
DC Power Distribution
DC
DC
DC
7
630

FIG. 6

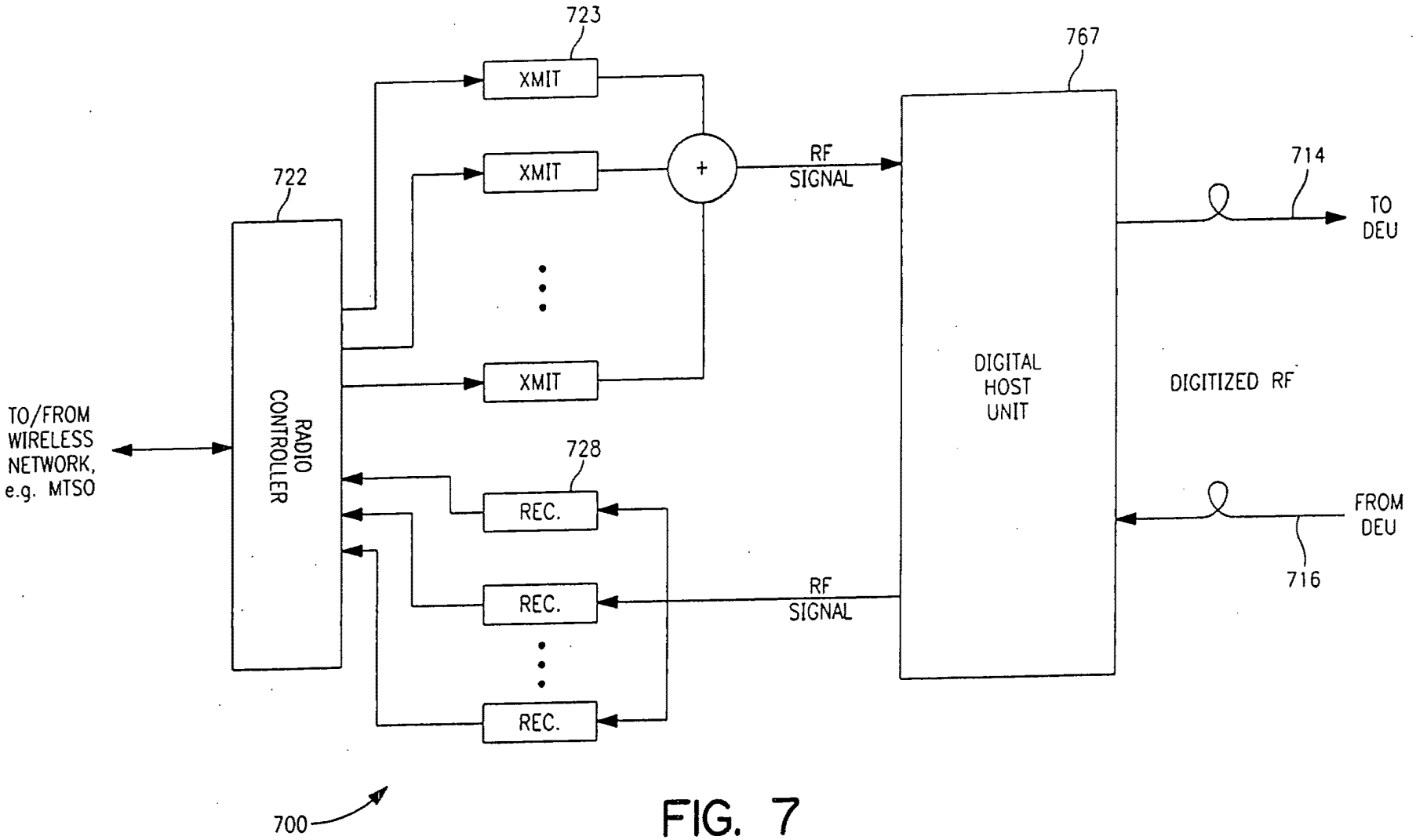

723
767
XMIT
XMIT
XMIT
+
RF
SIGNAL
714
TO
DEU
722
TO/FROM
WIRELESS
NETWORK,
e.g. MTSO
RADIO
CONTROLLER
DIGITAL
HOST
UNIT
DIGITIZED RF
728
REC.
REC.
REC.
RF
SIGNAL
FROM
DEU
716
700

FIG. 7

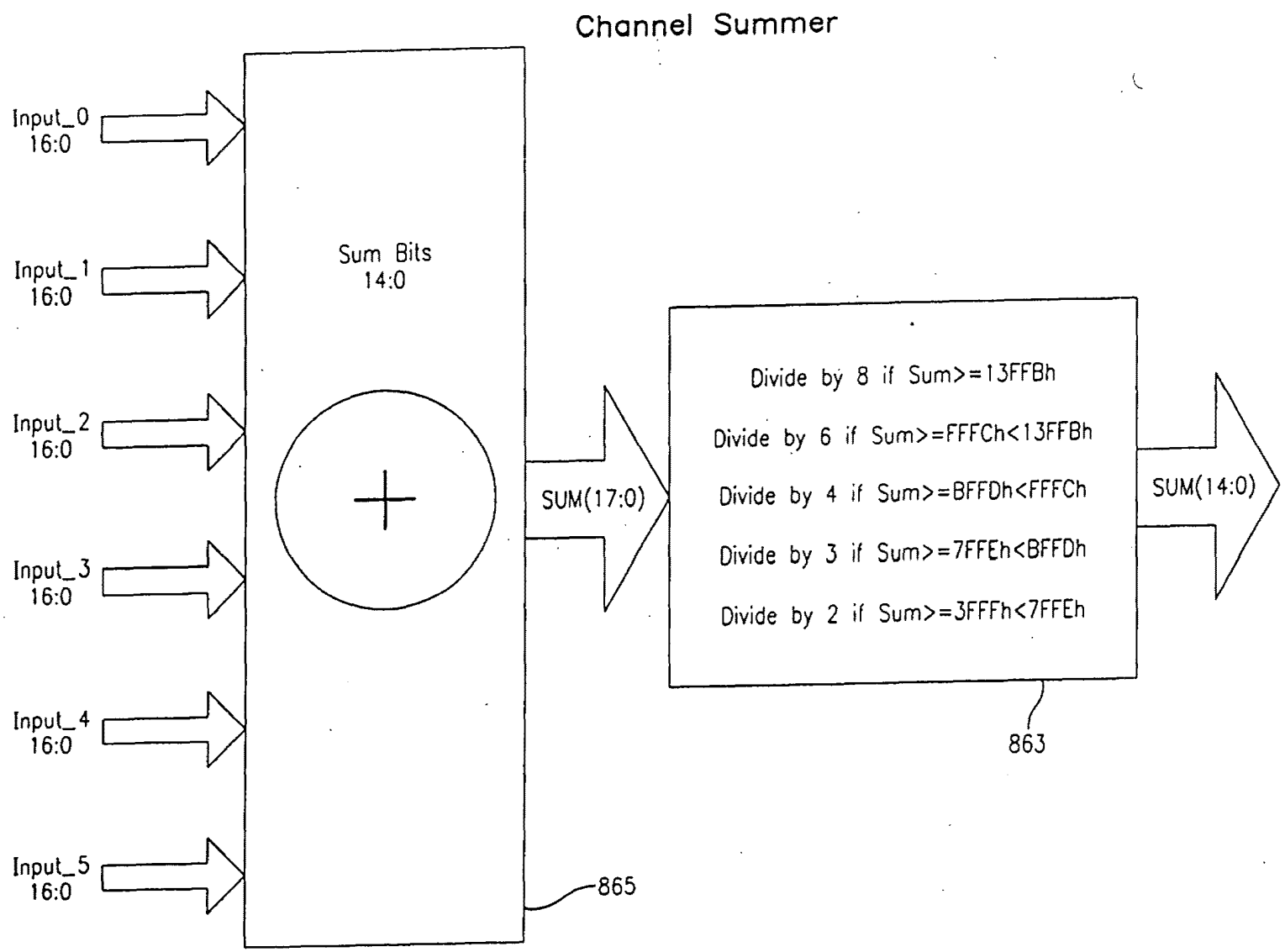

Channel Summer
Input_0
16:0
Input_1
16:0
Input_2
16:0
Input_3
16:0
Input_4
16:0
Input_5
16:0
Sum Bits
14:0
SUM(17:0)
Divide by 8 if Sum>=13FFBh
Divide by 6 if Sum>=FFFCh<13FFBh
Divide by 4 if Sum>=BFFDh<FFFCh
Divide by 3 if Sum>=7FFEh<BFFDh
Divide by 2 if Sum>=3FFFh<7FFEh
SUM(14:0)
863
865

FIG. 8

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT; the specification of which is attached hereto.

I have reviewed and understand the contents of the above-identified specification, including the claims.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. § 1.56.

I claim foreign priority benefits under 35 U. S.C. § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY	Priority Not Claimed	Certified Copy Attached
NONE				

I claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYY)
NONE	

I claim the benefit under 35 U.S.C. § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose material information as defined in Title 37 C.F.R. § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. or PCT Application Number	Filing Date (MM/DD/YYYY)	Patent No.
NONE		

As a named inventor, I appoint the following registered practitioners to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith, with full right of substitution:

Name	Registration Number	Name	Registration Number
Fogg, David N.	Reg. No. 35,138	Polglaze, Daniel J.	Reg. No. 39,801
Leffert, Thomas W.	Reg. No. 40,697	Slifer, Russell D.	Reg. No. 39,838

Please direct all correspondence in this case to:

Fogg, Slifer & Polglaze, P.A.
P.O.Box 581009, Minneapolis, MN 55458-1009
Telephone No. (612) 252-0014
Fax (612) 252-0019

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Inventor							
Given Name (First and Middle [if any])				Family Name or Surname			
Philip M.				WALA			
Inventor's Signature	Philip M. Wala					Date 7/19/00	
Residence: City	Waseca	State	MN	Country	USA	Citizenship	USA
Post Office Address	504 14TH Avenue NW						
City	Waseca	State	MN	Zip	56093	Country	USA

APPLICATION DATA SHEET

APPLICATION INFORMATION

Application Type::	Regular
Subject Matter::	Utility
Suggested Classification::	
Suggested Group Art Unit::	None
CD-ROM or CD-R?::	None
Number of CD disks::	0
Number of Copies of CDs::	0
Sequence submission?::	None
Computer Readable Form (CRF)?::	N/A
Number of Copies of CRF::	0
Title::	POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT
Attorney Docket Number::	100.019US02
Request for Early Publication?::	No
Request for Non-Publication?::	No
Suggested Drawing Figure::	1
Total Drawing Sheets::	8
Small Entity?::	No
Petition Included?::	No
Petition Type::	N/A
Licensed US Govt. Agency::	N/A
Contract or Grant Numbers::	N/A
Secrecy Order in Parent Appl.?::	No

APPLICANT INFORMATION

Applicant Authority Type:: Inventor

Primary Citizenship Country:: US

Status:: Full Capacity

Given Name:: Philip

Middle Name:: M.

Family Name:: Wala

Name Suffix::

City of Residence:: Waseca

State or Province of Residence:: MN

Country of Residence:: US

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State or Province of Mailing Address:: MN

Country of Mailing Address:: US

Postal or Zip Code of Mailing Address:: 56093

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Phone number:: 612.332.4720

Fax Number:: 612.332-4731

E-Mail Address:: ryan@fogglaw.com

REPRESENTATIVE INFORMATION

Representative Customer Number::	34206	
Representative Designation::	**Registration Number::**	**Representative Name::**
Primary	David N. Fogg	35,138
Associate	Scott V. Lundberg	41,958
Associate	Laura A. Ryan	49,055
Associate	Jon M. Powers	43,868
Associate	Laura A. Ryan	49,055
Associate		
Associate		
Associate		
Associate		
Associate		
Associate		
Associate		
Associate		
Associate		
Associate		

DOMESTIC PRIORITY INFORMATION:

Application:	Continuity Type:	Parent Application:	Parent Filing Date:
This Application is a	Continuation of	09/619,431	07/19/00

FOREIGN PRIORITY INFORMATION

Country::	Application number::	Filing Date::	Priority Claimed::
			No
			No
			No
			No
			No
			No
			No
			No
			No

ASSIGNMENT INFORMATION

Assignee name:: ADC Telecommunications, Inc.

Street of mailing address:: 13625 Technology Drive

City of mailing address:: Eden Prairie

State or Province of mailing address:: Minnesota

Country of mailing address:: US

Postal or Zip Code of mailing address:: 55344

Applicant(s)	Wala	INFORMATION DISCLOSURE STATEMENT
Serial No.	Unassigned	
Filing Date	Even Date Herewith	
Group Art Unit	Unassigned	
Examiner	Unassigned	
Attorney Docket No.	100.019US02	
Title: POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT		

Mail Stop Patent Application
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313

In compliance with 37 C.F.R. §§ 1.56 and 1.97, *et seq.*, the enclosed materials are brought to the attention of the Examiner for consideration in connection with the above-identified Application. Applicant respectfully requests that this Information Disclosure Statement be entered and the references listed on the attached Form 1449 be considered by the Examiner and made of record. Pursuant to MPEP §609, Applicant further requests that the Examiner initial next to each reference on the Form 1449 to indicate that the listed references have been considered. Applicant further requests that a copy of the initialed Form 1449 be returned with the next official communication.

Further pursuant to MPEP §609, because all of the references listed on the attached Form 1449 have been previously submitted and made of record in the parent application, U.S. Patent Application 09/619,431, filed July 19, 2000, copies are not submitted herewith.

The Examiner is invited to contact the Applicant's Representative at the below-listed telephone number if there are any questions regarding this communication.

Respectfully submitted,

Date: 12/19/2003

Laura A. Ryan
Reg. No. 49,055

Attorneys for Applicant
Fogg & Associates, LLC
P.O. Box 581339
Minneapolis, MN 55458-1339
T: 612-332-4720 F: 612-332-4731

PTO/SB/08A (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	Not Assigned
Filing Date	Even Date Herewith
First Named Inventor	Wala
Art Unit	Not Assigned
Examiner Name	Not Assigned
Attorney Docket Number	100.019US02

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number - Kind[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 4,760,573	7/26/1988	Calvignac et al.	
		US- 5,603,080	2/11/1997	Kallander et al.	
		US- 5,621.786	4/15/1997	Fischer et al.	
		US- 5,627,879	5/6/1997	Russell et al.	
		US- 5,642,405	6/24/1997	Fischer et al.	
		US- 5,644,622	7/1/1997	Russell et al.	
		US- 5,657,374	8/12/1997	Russell et al.	
		US- 5,765,097	6/9/1998	Dail	
		US- 5,765,099	6/9/1998	Georges et al.	
		US- 5,774,789	6/30/1998	Van der Kaay et al.	
		US- 5,852,651	12/22/1998	Fischer et al.	
		US- 5,878,325	3/2/1999	Dail	
		US- 5,946,622	8/31/1999	Bojeryd	
		US- 5,969,837	10/19/1999	Farber et al.	
		US- 6,112,086	8/29/2000	Wala	
		US- 6,147,786	11/14/2000	Pan	
		US- 6,198,558	3/6/2001	Graves et al.	
		US- 6,362,908	3/26/2002	Kimbrough et al.	
		US- 6,486,907	11/26/2002	Farber et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] -Number[4] -Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		DE - -3707244-- A	9/15/1988	Schalamon		
		EP - -0 664 621	7/26/1994	Zarem et al.		

Examiner Signature		Date Considered	

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

PTO/SB/08B (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449B/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	Not Assigned
Filing Date	Even Date Herewith
First Named Inventor	Wala
Art Unit	Not Assigned
Examiner Name	Not Assigned
Attorney Docket Number	100.019US02

OTHER PRIOR ART -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, pate(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		AKOS ET AL., DIRECT BANDPASS SAMPLING OF MULTIPLE DISTINCT RF SIGNALS, 7/1999, Page(s) 983-988, Volume 47, Publisher: IEEE Transactions on Communications.	
		FOXCOM WIRELESS PROPERIETARY INFORMATION, LITENNA IN-BUILDING RF DISTRIBUTION SYSTEM, Page(s) 1-8, 1998.	
		FOXCOM WIRELESS PROPRIETARY INFORMATION, APPLICATION NOTE RFIBER-RF FIBEROPTIC LINKS FOR WIRELESS APPLICATIONS, Page(s) 3-11, 1998.	
		NAKATSUGAWA ET AL., SOFTWARE RADIO BASE AND PERSONAL STATIONS FOR CELLULAR/PCS SYSTEMS, Page(s) 617-621, Publisher: IEEE, 2000.	
		Gallagher, U.S. Serial No. 09/273,197, "DIGITAL RETURN PATH FOR HYBRID/FIBER COAX NETWORK", filed on March 19, 1999 (copy enclosed).	
		Donohue et al., U.S. Serial No. 09/432,558, "DIGITAL NODE FOR HYBRID/FIBER COAX NETWORK", filed on November 3, 1999 (copy enclosed).	
		Donohue, U.S. Serial No. 09/433,332, "DIGITAL RETURN PATH FOR HYBRID/FIBER COAX NETWORK", filed on November 3, 1999 (copy enclosed).	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time your are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2003

Application or Docket Number: 100.019US02

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	36	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	36 minus 20=	* 16
INDEPENDENT CLAIMS	7 minus 3 =	* 4
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	385.00	OR	BASIC FEE	770.00
X$ 9=		OR	X$18=	288
X43=		OR	X86=	344
+145=		OR	+290=	
TOTAL		OR	TOTAL	1402

CLAIMS AS AMENDED - PART II

AMENDMENT A	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

12/29/2003 RMEBRAHT 00000032 10740944

01 FC:1001	770.00 OP
02 FC:1201	344.00 OP
03 FC:1202	288.00 OP

PTO-1556
(5/87)

*U.S. Government Printing Office: 2001 — 481-697/59173

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/740,944	12/19/2003	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/KIMBERLY PANNELL/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.